Energizr™ Renewable Energy Storage

User and Installation Manual

V2.0

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About this manual

Purpose:
The purpose of this manual is to provide explanations and guidance for the installation, operation, and maintenance of Energizr.

Audience:
This Manual is intended for a professional electrician or technician for the purposes of installing, commissioning, and operating Energizr. All personnel using this manual must be trained and certified, and be familiar with all local and national electrical and construction codes relating to the installation of this equipment. All persons involved in any way with installing, commissioning, turning on, servicing, and maintaining this equipment must:

- Read this instruction manual thoroughly and follow the instructions to the letter.
- Be suitably qualified.
- Have sound knowledge of working, and dealing, with electrical installations.

This equipment has been manufactured in accordance with state of the art and general safety engineering principles. Nevertheless, incorrect operation or misuse may still endanger:

- The life and well-being of the installer, operator, and third parties.
- The equipment and other tangible assets belonging to the installer, operator, and owner.
- Working efficiency of the equipment.

All the safety instructions, warning signs, and labels on the equipment itself:

- Must be kept in a legible condition.
- Must not be damaged.
- Must not be removed or relocated such that they alter the intent of the warning.
- Must not be covered, hidden, or painted over.

Any malfunction(s) that may impair the safe operation of Energizr must be remedied immediately, and before, Energizr is turned on.

Disclaimer of Liability

Since the use of this manual and the conditions or methods of installation, operation, use, and maintenance of Energizr is beyond the control of JLM Energy, Inc., JLM does not assume responsibility and expressly disclaims liability for loss, damage, or expense, whether direct, indirect, consequential, or incidental, arising out of, or in any way connected with such installation, operation, use, or maintenance.

Due to continuous improvements and product updates, the images shown in this manual may not exactly match the unit purchased.

Restrictions on Use

Energizr shall not be used in connection with life support systems, life-saving equipment, or other medical equipment or devices. Using Energizr with this particular type of equipment is at your own risk.

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that must be followed during the installation and operation of this product. All electrical work must be performed in accordance with local, state, and federal electrical and building codes.

Read all instructions and safety information contained in this manual before installing or using this product. This product is designed for indoor / compartment installation. It must not be exposed to rain, snow, moisture, or liquids of any type.

Use insulated tools to reduce the chance of electrical shock or accidental short circuits. Remove all jewelry, such as rings, watches, bracelets, etc., when installing or performing maintenance on Energizr.

Always disconnect the batteries or energy source prior to installing or performing maintenance on Energizr. Live power may be present at more than one point because an inverter utilizes both battery and AC power.

Always verify proper wiring prior to turning on, or starting, Energizr.

There are no user serviceable parts contained in this product. Service personnel cannot and must not access the internal components of this product in the field.

This unit is provided with integral and internal protection against overloads.

The input and output AC and DC circuits are isolated from the chassis of Energizr. System grounding of Energizr, in accordance with the National Electric Code (NEC), is the responsibility of the installer.

It is the responsibility of the installer to provide external protection for the AC circuit conductors of the Utility/Grid, Loads, Renewables, and Generator circuits in the form of circuit breakers and/or fused disconnects. It is the responsibility of the installer to provide external protection for the DC circuit conductors of the battery system in the form of a circuit breaker or fused disconnect. Class 1 wiring methods are to be used for field wiring connections to terminals of a Class 2 circuit.

Only copper circuit conductors, with a minimum temperature rating of 90°C, are to be installed and used with Energizr.

Safety Symbols

To reduce the risk of electrical shock, fire, or other safety hazards, the following safety symbols have been placed throughout this manual to indicate dangerous and important safety instructions.

WARNING: This symbol indicates that failure to take a specified action could result in physical harm to the user.

CAUTION: This symbol indicates that failure to take a specified action could result in damage to the equipment.

Info: This symbol indicates information that emphasizes or supplements important points of the main text.

IMPORTANT BATTERY SAFETY INSTRUCTIONS

Eye protection (safety glasses or face shield) must be worn when working with batteries.

Remove all jewelry, such as rings, watches, bracelets, etc., when installing or performing maintenance on Energizr.

Never work alone. Always have someone near you when working around, or with, batteries.

Use proper lifting techniques when working with batteries.

Never use old or untested batteries. Check each battery's label for age, type, and date code to ensure all batteries are identical. Batteries are sensitive to changes in temperature. Always install batteries in a stable environment. Install batteries in a well- ventilated area as batteries can produce explosive gases.

For compartment or enclosure installations, always vent batteries to the outside. Provide at least one inch of air space between batteries to provide optimum cooling.

Never smoke while in the vicinity of batteries.

To prevent a spark at a battery system and reduce the chance of explosion, always connect the battery cables to the batteries first. Connect the battery cables to Energizr second.

Use insulated tools at all times.

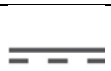
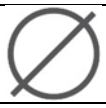
Always verify proper polarity and voltage before connecting the batteries to Energizr.

To reduce the chance of fire or explosion, do not short-circuit the batteries.

In the event of accidental exposure to battery acid, wash the affected area thoroughly with soap and water. In the event of accidental exposure to the eyes, flood the affected area with running water for at least 15 minutes and seek immediate medical attention.

Recycle old batteries.

Symbol Definitions:

		
DC – This symbol is used when direct current (DC) circuits are being dealt with.	**AC** – This symbol is used when alternating currents (AC) circuits are being dealt with.	**Phase** – This symbol is used to identify how many phases are associated with the alternating current (AC) circuit.

SAVE THESE INSTRUCTIONS

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Energizr™ Renewable Energy Storage

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1.0 Introduction

1.1 Product Overview

- Pure sine wave output (<5% THD).
- 120VAC Single Phase or 240 VAC Split phase output, 4400VA (off-grid)
- 120VAC Single Phase or 240 VAC Split phase output, 7200VA (on-grid)
- Power Factor Corrected
- 5-Stage, highly efficient battery charger
- Parallel up to four units to increase output power capability.
- Direct external generator connectivity
    - Compatible with 2-wire or 3-wire generator starters
- Multiple communication protocols:
    - Ethernet, WiFi, 2G Cell, or 3G cell
    - RS-485 isolated and bi-directional
    - Embedded 900 MHz radio
- Measurz-compatible for installation, programming, and monitoring via the Internet
- Local programming available via the Ethernet port, or 900 MHz port, using JLM's Controlrz (USB Dongle Device)
- Single ON/OFF operating button with LED indicator
- Hard-wired AC connections
- Built-in Battery Temperature Sensor
- Dimensions: 32" H x 16" W x 9" D
- Variable Speed Fan-Cooled (0 to 120 CFM) with temperature sensors on all critical components
- Operating Temperature: -20°C to 55°C
- Non-operating Temperature: -40°C to 70°C
- Operating Humidity: 95% relative humidity, non-condensing
- Weight: 96 lbs.
- Shipping Weight: 110 lbs.
- Mounting: Single-stud mounting with the included bracket
- Max Operating Altitude: 15000 feet
- UL 1741, 2nd Edition and CSA STD C22.2 No. 107.1-01
- Warranty: 5 years Parts and Labor (see warranty statement)

1.2 Basic Operation Information

Energizr is an electronic device that takes DC (Direct Current) voltage from batteries and turns it into 120/240V Split Phase AC (Alternating Current) voltage, which is needed to power household electrical appliances (i.e. AC loads).
Energizr also includes a battery charger circuit that takes AC power (when connected to utility/generator power) and transforms it into DC power to recharge batteries.

Inverter Applications
Energizr can be used for backup power in a home or office that normally uses utility power. When utility power is available, Energizr keeps the batteries charged. When utility power fails, Energizr automatically inverts DC power from the batteries to supply AC power during power failure.

For a home or business, reliable back-up power is necessary to prevent the loss of computer data, to maintain lights, and keep food fresh in the refrigerator/freezer. In some areas, where utility power is not available, Energizr can be used as a stand-alone renewable power system.

Energizr allows AC electrical appliances to run using the energy stored in the system's battery bank. When the battery bank is discharged, renewable sources (solar, wind or hydro power) can be used to recharge the batteries, or a generator can be connected to Energizr to power the system while the batteries recharge.

Info: Note that renewable sources such as solar panels and wind turbines can ONLY interface with Energizr by connecting via their own independent grid-tied inverters.

Advantages of a Pure Sine Wave Inverter
Today's inverters come in two basic output waveforms: modified sine (which is actually a modified square wave) and pure sine wave. Modified sine wave inverters approximate a pure sine waveform and will run most appliances and electronics without any problems.

These inverters are less expensive and, therefore, offer a viable alternative to more expensive pure sine inverters. Energizr provides a pure sine wave output. This waveform is equal to or, in many cases, better than the grid power used in your home.

Virtually any electronic device will operate from a pure sine wave inverter. Motors run cooler, microwaves usually cook faster and clocks keep better time just to name a few examples.

Without compromising quality or performance, Energizr provides all of the advantages of a pure sine wave inverter at a much lower cost than many in the market.

Appliances and Run Time

Energizr can power a wide range of household appliances including small motors, hair dryers, clocks and other electrical devices. As with any appliance using batteries for power, there is a certain length of time that it can run - this is called “run time.”

Actual run time depends on several variables including the size and the type of appliance, the type of batteries used for energy storage, as well as the battery’s capacity and age.

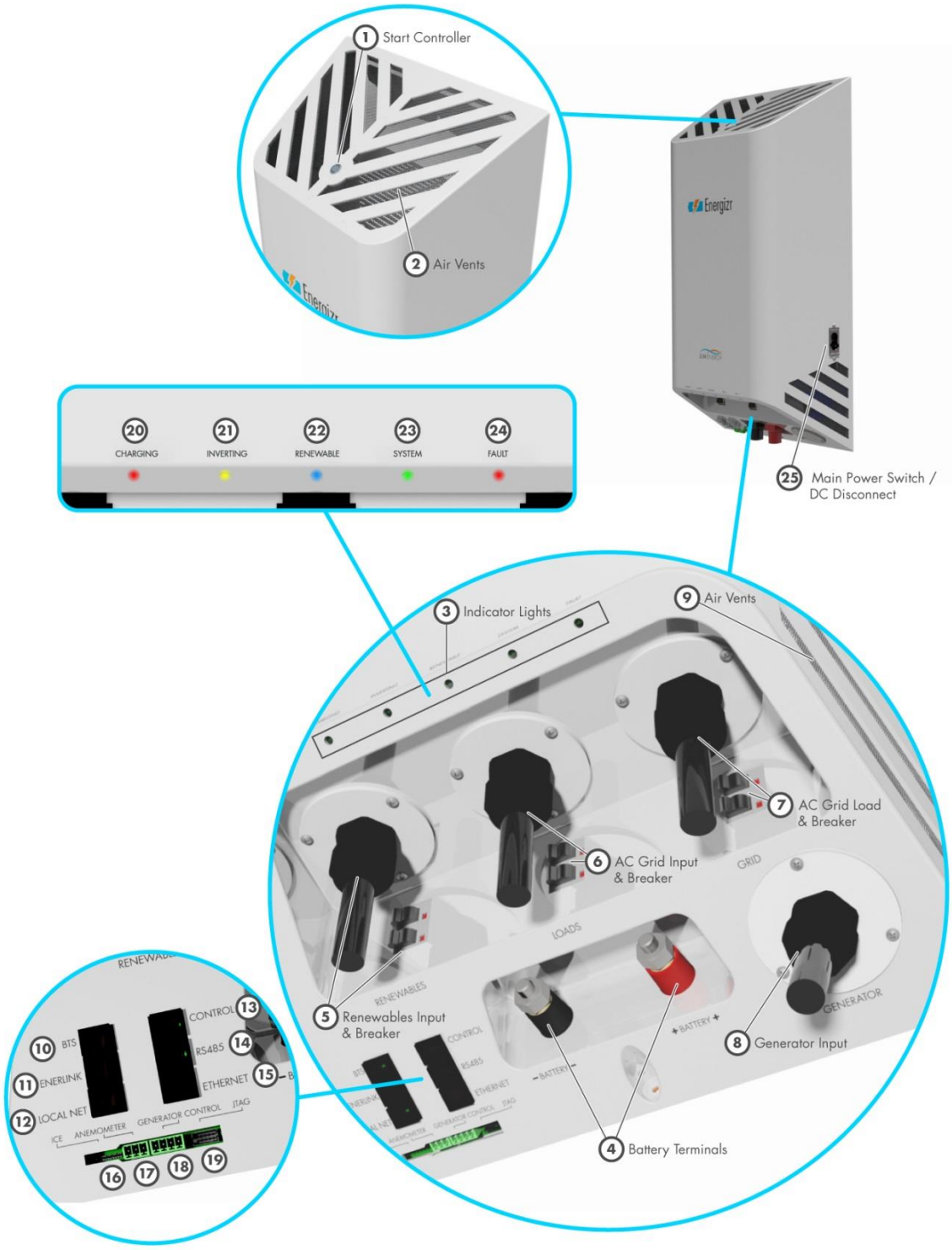
Other factors such as the battery’s state of charge and temperature can also affect the length of time your appliances can run.

Larger electrical appliances such as stoves, water heaters, etc., can quickly drain batteries and are not recommended to be powered by Energizr.

All electrical appliances are rated by the amount of power they consume. The rating is printed on the product’s nameplate label, usually located on its chassis near the AC power cord. It is often difficult to calculate exactly how long an inverter will run a particular appliance. The best way to proceed is trial and error.

Energizr has a built-in LBCO (Low Battery Cut Out) safeguard that automatically protects the batteries from over discharge.

Info: For Energizr to perform optimally, a minimum battery bank of 100 AH is recommended for moderate loads (<1000W) and greater than 200 AH for heavy loads (≥1000W).



Basic Features

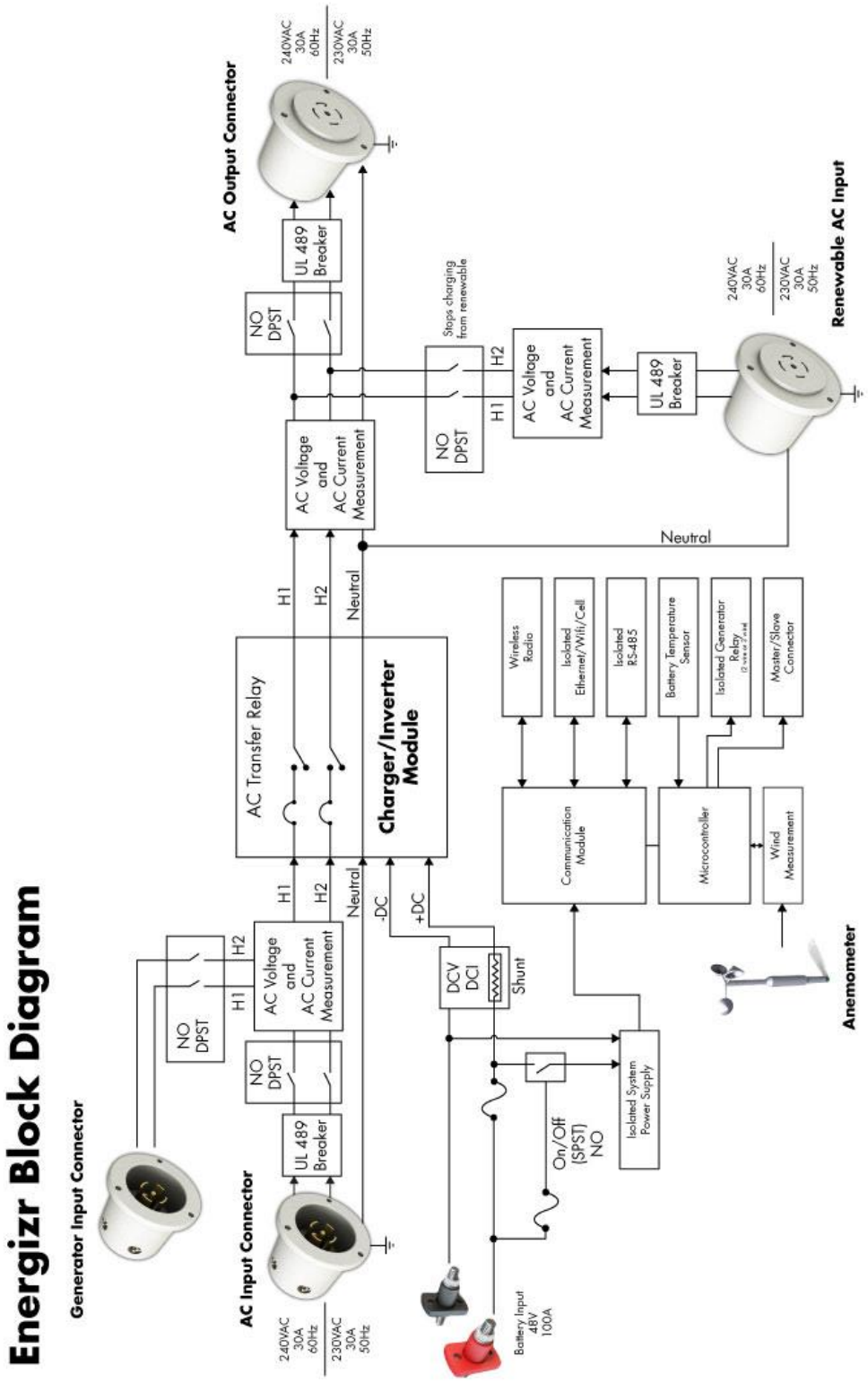
1: ON/OFF Button
2: Air Outlet Vents
3: LED Indicators
4: Battery positive and negative terminals
5: Renewable AC Port
6: Grid AC Port
7: Load AC Port
8: Generator AC Port
9: Air Inlet Vents
10: BTS: Battery Temperature Sensor RJ11 Connector
11: Enerlink: Paralleling port for connecting up to four Energizrs in parallel
12: Local Net
13: Control: Local Controller Connection
14: RS-485 Port
15: Ethernet Port
16: Measurement Controller Port
17: Anemometer Port
18: External Generator 2-wire or 3-wire controller
19: Internal Controller Port
20 to 24: LED indicators
25: Main Power Button and DC Disconnect Switch

1.3 Energizr Options:

Option-001: External Generator Interface
Option-002: No longer available
Option-003: AC circuit breakers for AC Input (Grid), AC Output (Load), Renewable Input, and Generator Input mounted in the Energizr Junction Box
Option-004: Wi-Fi (instead of Ethernet)
Option-005: No longer available
Option-006: No longer available
Option-007: Wireless Radio Connectivity
Option-008: RS-485 Connectivity
Option-009: Energizr Controller
Option-010: Energizr Parallel Controller
Option-011: Battery Rack

For further details on Energizr options, please see section 4.4.

1.4 Block Diagram



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1.5 Specifications

Inverter Specifications:

Output Waveform	Pure Sine Wave
Inverter Efficiency	Min Efficiency:70% (less than 500 VA) >90%: 500 VA to 1000VA 94% : 1000 VA to 2000 VA Degrading to 88% at 4400 VA
Input Battery Voltage Range	36.0 to 67.6 VDC
Absolute Maximum DC Input	68 VDC
Nominal AC Output Voltage	120Vrms Single phase or 240Vrms Split phase
AC Output Voltage Accuracy	±5%
Output Frequency Accuracy	60 Hz ± 1%
Total Harmonic Distortion	<5%
Continuous Power Output (25 °C and 12.5VDC) (Off-Grid)	4400 VA
Continuous AC Output Current (Off-Grid)	120VAC: 29.7A; 240VAC: 18.3 A
No-load Power Consumption	35 watts

Current Surge Specifications:

1 ms Surge Current	120VAC: 120A and 240VAC:70A
100 ms Surge Current	120VAC: 75A and 240VAC:40A

Power Surge Specifications:

5 s Power Surge (Watts) (On-Grid)	8500 Watts
30 s Power Surge (Watts) (On-Grid)	6000 Watts
5 min Power Surge (Watts) (On-Grid)	5400 Watts
30 min Power Surge (Watts) (On-Grid)	4800 Watts
10 s Power Surge (Watts) (Off-Grid)	4800 Watts

DC Specifications:

Battery High Voltage Cutout	67.6 V (48V nominal)
Maximum Continuous Current	100 A
High Battery Voltage Cut Out	67.6 V
High Battery Voltage Cut In	66.4 V
Low Battery Voltage Cut out	36.0 V (programmable at the factory)
Low Battery Voltage Cut In	50.0 V

Charger Specifications:

Charger Type	Five-stage (Bulk, Absorb, Float, Equalize, Maintain)
Charger Peak Efficiency	90%

AC Input Voltage Range	120VAC: 60 to 140 VAC 240VAC: 120 to 280 VAC
AC Input Frequency Range	50 to 70 Hz
Continuous Current Output @ 25°C	60 ADC at 56.4 VDC
Input Current at rated output	17.5 Arms at 120Vrms per leg
Battery Temperature Compensation	0 to 50°C
Power Factor	>0.95

Transfer Relay Specifications:

Transfer Time	16 ms
Max AC Current per Leg	30 Arms

AC Measurement Specifications:

Number of channels	4, optically-isolated
AC Voltage range	250 Vrms
Measured Parameters	Vrms, Arms, Peak V, Peak A, PF, Freq., Power
Measurement Accuracy	3% FS

DC Measurement Specifications:

Number of channels	1, optically-isolated
DC Voltage range	75 V
Measured Parameters	V, A, Power (bi-directional)
Measurement Accuracy	3% FS

1.6 The Energizr Advantage

The Energizr product family from JLM is the manifestation of our belief that the world of energy is moving away from central generation and towards self-generation. To realize the full potential of this inevitable and monumental transition, we need to innovate with ideas, products, and technologies. One of the key elements of success is the recognition that we need to allow various sources of energy to coexist in harmony. Our customers would have to be able to effectively and efficiently combine the use of renewable energy, the grid, energy storage, and a local generator.

Clearly, the underlying effort of improving energy efficiency is critical. However, we need to also continue our focus on energy availability. Energizr is the first in a series of products from JLM targeting energy availability in a world of increasing self-generation.

Although Energizr is the first product of its kind, it is important to highlight its advantages over other products in the market. While Energizr is not the only product with these differentiating features, it is the only product that brings all of these features into a single, well-integrated platform:

On-Grid or Off-Grid
Energizr is designed to work seamlessly with or without the presence of the grid. Most customers are surprised to find out that their renewable resources, such as their solar panels or wind turbines, are deemed unproductive when the grid is not available. Energizr not only provides for purely off-grid situations but it also provides for productive use of renewables even when the grid is not available.

Works With Grid-tie Inverters
Existing solar or wind turbine installations may connect seamlessly to the Energizr. This provides a tremendous opportunity for our dealers to upgrade their existing PV or wind customers.

Renewable Energy Integration
Energizr is equipped to integrate seamlessly with grid-tied or off-grid renewable installations. System integration is now as simple as connecting the output of the system to the Renewable connector on Energizr.

Internal Combustion Generator Integration
In off-grid application, even in well-designed systems, there is always the possibility of running out of energy. It is important to fulfill the promise of energy availability by integrating an internal combustion engine with the system. Energizr provides for simple integration and is capable of controlling a variety of different generators.

120V or 240V 50Hz or 60Hz
Energizr is capable of integrating with systems operating at 120V or 240V single-phase. In addition, it is designed to work with both 50 Hz and 60 Hz grid frequencies.

Attractive Design
Customers are pleased by a product that performs well. However, too often we tend to forget that the product design aesthetics are just as important. At JLM we expend a great deal of effort on providing an attractive design for our products. Energizr is touted by many of our dealers as the most attractive energy platform of its kind.

Expandable, Parallel Capability
Up to four Energizrs can be combined to yield a 17.6 kVA system.

Embedded Communication
Energizr is designed to act as the nerve center of a highly available energy system. As such robust communication capabilities are essential, Energizr is designed to connect to the Internet or a computer using its network connectivity function which is equipped with Ethernet or Wi-Fi formats.

In addition, for local or machine-to-machine communications, Energizr is equipped with a wireless, 900 MHz radio and an isolated RS-485 port.

Event-Driven Programmability
Energizr is equipped with two dedicated processors. One of the processors is in charge of measurements and communications while the second processor is managing various events to adjust the functionality of the system. An example of a real-time event would be the disappearance of the grid. Another example would be the depth-of-discharge of the battery falling below a certain level. In these cases, for example, the customer might be interested in adjusting the functionality of the system accordingly. The disappearance of the grid might mean making sure that the essential loads in the system connect to the batteries instead of the grid. On the other hand, if the batteries are running low and the grid is still not available, the system owner might be interested in turning on the external generator. These are examples of events that are managed by Energizr.

Time-Driven Programmability
Some of the events listed above may be time or calendar-driven. For example, while the electricity is more expensive (during the peak hours), the system owner might be interested in using the energy stored in the batteries instead of using the grid. Such functions may be programmed by using Energizr's calendar and energy tariff table functionality.

Demand/Response Platform
With event- and time-driven programmability, seamless communication capabilities and built-in tariff table functionality, Energizr is the only product of its kind penetrating the burgeoning demand/response marketplace for small and medium sized buildings.

Embedded Transfer Switch
In grid-tied applications where the grid is the main source of energy, seamless battery back-up connectivity is critical for high energy availability applications. Switching the entire load from the grid onto the local, battery-generated micro-grid is the job of the transfer switch. Energizr is equipped with a transfer switch capable of switching to the local micro-grid in 16 ms, which is less than one cycle of the 60 Hz grid.

Easy Installation
Energizr was designed with the system designer and system installer in mind. Several steps were taken to ensure ease of installation:

1. **Single-stud Installation**: A custom-designed bracket, shipped as a standard accessory helps with quick installation on a single stud. The system installer is no longer required to devise and install complicated and unattractive back plates.
2. **Light Weight**: At 96 lbs., Energizr's weight is 50% lighter than its closest competitor.
3. **High-level of Integration**: System connectivity, measurement capabilities, and AC and DC connectivity using on-board relays all serve as time-saving features for the installer.
4. **AC Connectivity**: The grid input, the essential load output, the generator input and the renewables input of Energizr may be interfaced by using the standard 4-conductor cables attached to the bottom of Energizr.

Energy Conservation and Energy Generation:
Energizr is designed and manufactured by JLM Energy, Inc. JLM is an energy technology company that offers a wide range of energy conservation and energy generation products. JLM is well-positioned to help reduce the energy footprint of a building and increase energy availability using the following products and services:

Energizr™:	Renewable Battery Systems
Gridz™:	Commercial and Industrial-scale Energy Storage Systems
Measurz™:	Enterprise Energy Management
Powrz™:	Demand Management System
Zefr™:	Urban Arrayed Wind Turbines
Solarz™:	Flexible PV Solar systems
Gyezr™:	Commercial Grade Solar Thermal Systems

Common Control Software Platform:
One of the key advantages of Energizr is that it can be installed, programmed and monitored using Measurz, JLM's cloud-based software platform. Measurz monitors the overall health of the system and measures the energy produced and consumed in real-time. Measurz is also compatible with JLM's entire portfolio of products mentioned above. This provides the opportunity to grow energy conservation and generation initiatives cohesively and incrementally by managing all initiatives under the same cloud-based monitoring platform.

Pricing
The integration of features reduces the cost of installation and the overall cost of ownership by minimizing field failures. Typically, it should be expected that a system configured with Energizr is 20% to 35% lower in costs when compared to competitors.

2.0 Installation

2.0 Installation

Before installing Energizr, read the entire installation section. The more thoroughly you plan in the beginning, the smoother the process.

Info: If you are installing multiple Energizrs in parallel, follow all information in this section and refer to section 3.10 for specific parallel instructions.

Info: Installations should be performed by qualified personnel, such as a licensed or certified electrician. It is the installer's responsibility to determine which safety codes apply and to ensure that all applicable installation requirements are followed.

CAUTION: Review the "Important Product Safety Information" and the "Important Battery Safety Instructions" before any installation.

The simplified system diagrams shown in this manual are provided to assist you in planning and designing your installation. They are not intended to over-ride or restrict any national or local electrical codes. These diagrams should not be the determining factor as to whether the installation is compliant. That is the responsibility of the electrician and the on-site inspector.

CAUTION: Energizr is heavy. Use proper lifting techniques during installation to prevent personal injury.

2.1 Pre-Installation

2.1.1 Unpacking and Inspection

Carefully remove Energizr from its shipping container and inspect all contents. Verify the following items are included:

1. The Energizr Main Unit
2. Red and black DC terminal covers with Phillips screws
3. Battery Temperature Sensor with 15 foot cable
4. Energizr Mounting Plate
5. Bag of necessary hardware

If items appear to be missing or damaged, contact your JLM Dealer or JLM Energy directly. If at all possible, keep your shipping box. It will help protect your inverter from damage if it ever needs to be returned for service. Save your proof-of-purchase as a record of your ownership; it will also be needed if the unit should require service.

Record the unit's model and serial number in the front of this manual in case you need to provide this information in the future. It is much easier to record this information now, instead of trying to gather it after the unit has been installed.

2.1.2 Required Components and Materials

Installation Tools Required:

1. Assorted screw drivers
2. Assorted wrenches
3. Wire strippers
4. Drill and drill bits
5. Pliers
6. Pencil or Marker
7. Multimeter
8. Level

Hardware / Materials Required to Install Energizr:

1. 1/4" and 3/8” mounting hardware for Energizr, junction box, and battery rack.
2. Wire ties
3. Wire nuts
4. Means of disconnecting Energizr from the batteries if a non-JLM battery rack is used.
5. Means of terminating Energizr’s input and output cables into a junction box if the Energizr junction box is not used.

2.1.3 Locating Energizr

Only install Energizr in a location that meets the following requirements:

Clean and Dry - Energizr should not be installed in an area that allows dust, fumes, insects, or rodents to enter or block Energizr's ventilation openings. This area also must be free from any risk of condensation, water, or any other liquid that can enter or fall on or in Energizr.

Energizr uses stainless steel fasteners, plated copper and aluminum buss-bars, along with a powder-coated steel frame and cover. In addition, circuit boards are conformal coated. This is done to help fight the harmful effects of corrosive environments. However, the life of Energizr is uncertain if used in corrosive environments, and failure under these conditions is not covered under warranty.

Info: If Energizr is installed in the presence of moisture, we recommend putting silicone dielectric grease compound into the RJ45/RJ11 electrical ports or any other ports. Silicone dielectric compound makes for an effective moisture barrier to help prevent corrosion.

Cool - Energizr should be protected from direct sun exposure or equipment that produces extreme heat.

Info: The ambient temperature around Energizr must not exceed 77°F (25°C) to meet power specifications.

Ventilation - In order for Energizr to provide full output power and avoid over-temperature fault conditions, do not cover or block Energizr's ventilation openings or install in an area with limited airflow. Energizr uses two internal fans to provide forced air cooling; these fans pull in air through the intake vents and blow out air through the exhaust vents. Allow, at the minimum, an airspace clearance of 6"at the intake and exhaust vents and 3" everywhere else to provide adequate ventilation.

If Energizr is installed in an enclosure, a fresh air intake opening must be provided directly adjacent to the two air intakes on the low side of Energizr and a larger air outlet at the top of the unit. This will allow cool air from the outside to flow into Energizr and heated air to exit from Energizr and out of the enclosure. When mounted in an enclosed compartment, airflow must be at least 100 CFM in order to maintain no more than a 68°F (20°C) rise in internal compartment temperature.

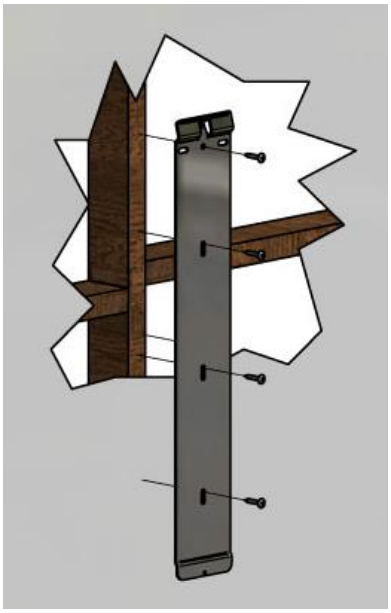
CAUTION: Do not install Energizr in a zero clearance compartment. Do not cover or obstruct the ventilation openings - overheating may result.

Safe - Keep any flammable or combustible material (i.e. paper, cloth, plastic, etc.) that may be ignited by heat, sparks, or flames at a minimum distance of 2 feet away from Energizr. Do not

install Energizr in an area that contains extremely flammable liquids like gasoline or propane, or in locations that require ignition-protected devices.

Close to the battery bank - Energizr should be located as close to the batteries as possible. Long DC wires tend to reduce efficiency and reduce the overall performance of an inverter. The absolute maximum recommended battery cable length is 15 feet. **The battery bank should be installed within 15 feet of Energizr.**

However, the unit should not be installed in the same compartment as the batteries or mounted where it will be exposed to gases produced by the batteries. These gases are corrosive and will damage Energizr; also if these gases are not ventilated and if allowed to collect, they could ignite and cause an explosion.

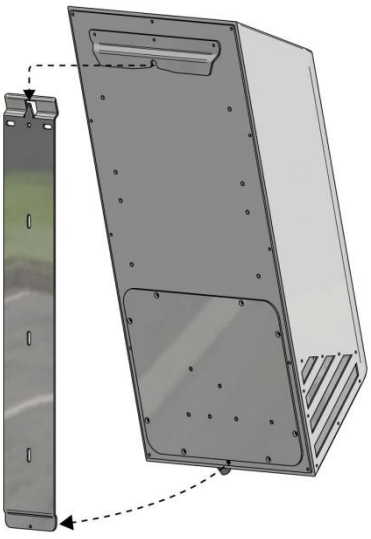


Accessible - Do not block access to Energizr as well as Energizr's controls and status indicator. Also allow enough room to access the AC and DC wiring terminals and connections, as they will need to be checked and tightened periodically.

Away from sensitive electronic equipment – Energizr can generate levels of RFI (Radio Frequency Interference). Locate any electronic equipment susceptible to radio frequency and electromagnetic interference as far away from Energizr as possible.

2.1.4 Mounting Energizr

Energizr base can reach a temperature up to 90°C (194°F), and it is recommended that it should be mounted on a noncombustible surface*. This surface and the mounting hardware must also be capable of supporting at least twice the weight of Energizr. To meet regulatory requirements, the Energizr Series must be mounted using the included single-stud mounting hardware.



** Noncombustible surface - A surface made of material that will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat as per the ASTM E136 standard. For the most part, these are materials that are largely comprised of inorganic materials such as stone, steel, iron, brick, tile concrete, slate and glass.*

2.2 Wiring Energizr

This section describes the methods, requirements, and recommendations for wiring Energizr.

All wiring should meet all local codes and standards, and be performed by qualified personnel such as a licensed electrician.

The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide the standards for safely wiring residential and commercial installations. The NEC/CEC lists the requirement for wire sizes, overcurrent protection and installation methods and requirements. Energizr systems involve power from multiple sources (inverter, generator, utility, batteries, solar arrays, etc.) which make the wiring more hazardous and challenging.

The input and output AC and DC circuits are isolated from Energizr's chassis. Energizr system grounding is the responsibility of the installer in accordance with the NEC.

Warning: Ensure all sources of DC power (i.e. batteries) and AC power (utility power, AC generator, or Grid-tied renewables) are de-energized (i.e. breakers opened, fuses removed, disconnect open) before proceeding - to prevent accidental shock.

All conductors that are at risk to physical damage must be protected by conduit, tape, or wire ties, or placed in a raceway. Always check for existing electrical, plumbing or other areas of potential damage prior to making cuts in structural surfaces or walls.

Both AC and DC overcurrent protection must be provided as part of the installation.
Energizr requires a reliable negative and ground return path directly to the battery.
Use only copper wires with a minimum temperature rating of 90°C.

Wire Routing

Before connecting any wires, determine all wire routes to and from Energizr.

Typical routing scenarios are:

1. AC input wiring from the main AC panel to Energizr
2. AC input wiring from a generator (optional) to Energizr
3. DC input wiring from the batteries to Energizr
4. AC output wiring from Energizr to the AC Loads sub-panel with dedicated circuits
5. AC Renewables wiring from Grid-tied inverters to the Energizr
6. Battery Temperature Sensor cable from Energizr to the batteries
7. Remote Control cable (optional) to Energizr
8. Ground wiring from Energizr to an external ground

Torque Requirements

- AC Torque Requirements: Torque all AC wiring connections to 16 in.-lbs. (1.8 Nm).
- DC Torque Requirements: Torque DC cable connections 100 in.-lbs. (11.3 Nm).
- DC Torque Requirements: Torque DC battery terminals to 30 ft.-lbs. (40.6 Nm).

2.2.1 Grounding Energizr

Energizr uses two separate electrical systems (AC and DC power). Therefore each electrical system is required to be properly connected to a permanent "ground" or "earth" reference.

A system that is properly grounded limits the risk of electrical shock, reduces radio frequency noise and minimizes excessive surge voltages induced by lightning.

To understand how the conductors in the electrical circuit will be connected to the system ground, the following terms should be understood:

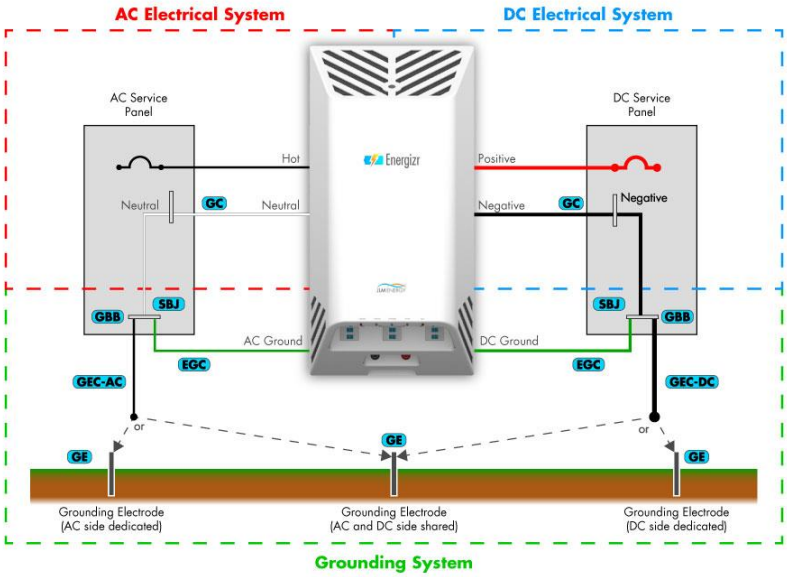
Grounded Conductor **(GC)**: The wire/cable in the electrical system that normally carries current (usually the AC neutral and/or the DC negative); and is intentionally connected or "bonded" to the ground system. This wire or the ends of this wire should be colored white in a 120/240 VAC system.

Equipment Grounding Conductor **(EGC)**: A wire/cable that does not normally carry current and is used to connect the exposed metal parts of equipment (that might be accidentally energized) to the grounding electrode system or the grounded conductor. This wire, or the ends of this wire, should be green or green with a yellow stripe; or this wire can be bare copper.

Grounding Electrode Conductor **(GEC)**: The wire/cable that does not normally carry current and connects the grounded conductor and/or the equipment grounding conductor to the grounding electrode at the service equipment.

Grounding Electrode **(GE)**: A ground rod or conducting element that establishes an electrical connection to the earth or common ground reference.

System bonding jumper (**SBJ**): The connection between the grounded circuit conductor in the electrical system and the equipment grounding conductor at a separately derived system.



Energizr Grounding

There are two types of grounding - equipment grounding and system grounding.
The exposed metal parts of the equipment in the system usually don't carry electricity. However, if the exposed metal becomes electrified by a live wire, a person touching this live part could complete the electrical circuit and receive a shock.

Equipment grounding prevents shock by connecting all the exposed metal parts of equipment (via Equipment Grounding Conductors - EGC) together at a common ground point (Ground Bus-Bar - GBB). This common ground point – installed in the service disconnect panel for each electrical system (AC and DC) - is then connected (via Grounding Electrode Conductor - GEC) to the common ground reference, such as a ground rod (Grounding Electrode - GE).

This connection to earth is made at only one point in each electrical system; otherwise, parallel paths will exist for the currents to flow. These parallel current paths would represent a safety hazard and are not allowed in installations wired per the NEC/CEC.
System grounding takes one of the current-carrying conductors (Grounded Conductor - GC) and attaches it to the common ground point (Ground Bus-Bar - GBB) usually by a System Bonding Jumper (SBJ) in each electrical service disconnect panel. On the DC side use the negative conductor; on the AC side use the neutral conductor. The closer the grounding connection is to the source, the better the protection from surges caused by lightning.

System Bonding Jumper

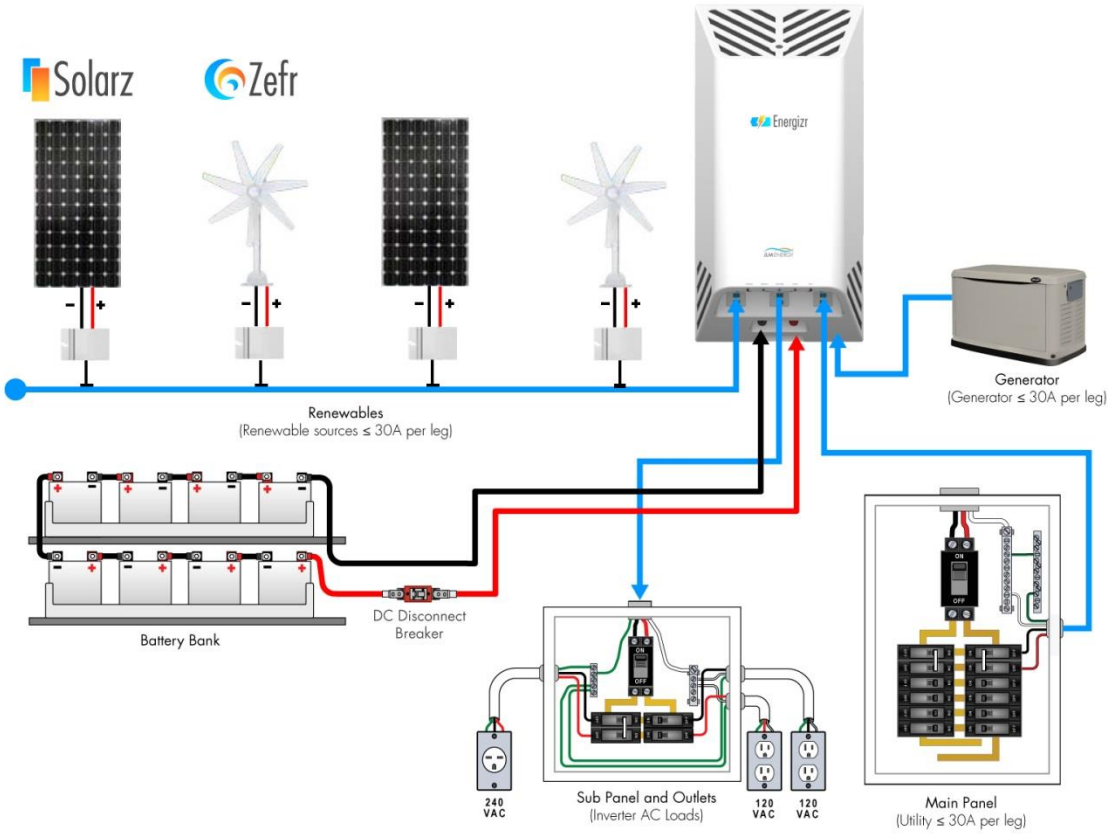
Energizr includes an internal bond between the Grounded Conductor (AC neutral/DC negative) and the equipment grounding terminals.

The System Bonding Jumper is internally installed within Energizr where the Equipment Grounding Conductor, the Grounding Electrode Conductor for all four AC ports (AC Grid, AC Generator, AC Loads and AC Renewables) and the DC Grounding Electrode Conductor are connected together on an internal Bus bar. The AC Grid ground wire connects this bus bar directly to the Grounding Electrode inside the AC load panel. This connection point also serves as a single connection point for connecting AC Neutral to ground. All AC and DC grounding cables use #10 AWG wire.

CAUTION: There should be one and only one point in each electrical system (both AC and DC) where the Grounded Conductor is attached to the Grounding Electrode Conductor.

2.2.2 DC Wiring

This section describes Energizr's required DC wire sizes, the recommended disconnect/overcurrent protection, and how to make the DC connections to Energizr and the battery bank. Refer to "AC and DC Wiring" Diagram.



AC and DC Wiring

WARNING: Even though DC voltage is "low voltage", significant hazards may be present, particularly from short circuits of the battery system.

CAUTION: Energizr is NOT reverse polarity protected, meaning that if the negative and positive battery voltage is connected backwards to Energizr, Energizr will likely be damaged. Verify correct voltage polarity using a voltmeter BEFORE connecting the DC wires.

Info: DO NOT connect the battery cables to Energizr until all wiring is complete and the correct DC voltage and polarity has been verified.

CAUTION: Before wiring the DC cables, review the safety information at the beginning of this manual and the following to ensure a safe and long-lived system:

- When Energizr is installed in a Photovoltaic System, the NEC requires that the DC circuit conductors and overcurrent devices to Energizr be sized to carry not less than 125 percent of Energizr's maximum current rating.
- The DC positive and negative cables connected to Energizr from the battery bank should be tied together with wire ties or electrical tape approximately every 6 inches. This helps improves the surge capability and reduces the effects of inductance, which improves Energizr's waveform and reduces the wear of Energizr's filter capacitors.
- Crimped and sealed copper ring terminal lugs with a 3/8" hole should be used to connect the DC wires to Energizr's DC terminals.
- The battery bank voltage MUST match the DC voltage required by Energizr (i.e. 48-volt battery bank) or Energizr may be damaged.
- To ensure the maximum performance from Energizr, all connections from the battery bank to Energizr should be minimized with the exception of the DC overcurrent disconnect in the positive line. Any other additional connection will contribute to additional voltage drops and these extra connection points may loosen over time.
- All wiring to the battery terminals should be checked periodically (once a month) for proper tightness. The torque requirement for the DC terminals is 100 in-lbs. (11.3Nm) and 30 ft.-lbs. (40.6 Nm) for the battery terminals. If you don't have a torque wrench, ensure all DC terminals are tight and cannot move.
- Be aware that over-tightening or mis-threading the nuts on the DC terminals can cause the bolts to strip and/or snap and break off.
- Make sure cables have a smooth bend radius and do not become kinked. Place long cable runs in conduit and follow existing wire runs where possible.
- A brief spark or arc may occur when connecting the battery cables to Energizr DC terminals. This is normal and is due to Energizr's internal capacitors being charged.
- Color code the DC cables/wires with colored tape or heat shrink tubing: RED for positive (+), and BLACK for negative (-).

DC Wire Sizing

It is important to use the correct DC wire to achieve maximum efficiency from the system and reduce fire hazards associated with overheating. Always keep your wire runs as short as practical to help prevent low voltage shutdowns. See Table below to select the minimum DC wire size and corresponding overcurrent device.

Max Continuous Current	NEC Current	DC Wire Length < 5 feet	DC Wire Length < 10 feet	DC Wire Length < 15 feet	DC Overcurrent Device	DC Grounding Electrode wire size
122 A	153 A	#2/0	#4/0	#4/0 x 2	175 A	#6 AWG

DC Overcurrent Protection

Energizr is equipped with internal programming that will protect itself in the event of an overcurrent situation above 100 ADC.

DC Cable Connections

Do not put anything between the DC cable ring lug and the battery terminal post or the flat metal part of Energizr's DC terminal. When connecting the DC cable to the battery or inverter DC terminals, the cable should be placed directly against Energizr or battery terminals. Incorrectly installed hardware causes a high resistance connection which could lead to poor performance and may melt the cable and terminal connections.

Tighten the terminal connections to 100 in.-lbs. (11.3 Nm).
Tighten the battery terminal connections to 30 ft.-lbs. (40.6 Nm).

Wiring the Battery Bank

WARNING: Lethal currents will be present if the positive and negative cables attached to the battery bank touch each other. During the installation and wiring process, ensure the cable ends are insulated or covered to prevent touching/shorting the cables.

Info: DO NOT connect the DC wires from the battery bank to Energizr until:

1) All DC and AC wiring is complete
2) The correct DC and AC overcurrent protection has been installed
3) The correct DC voltage and polarity have been verified.

Depending upon the type of batteries used in the installation (2V, 6V or 12 V), the batteries must be wired in series, parallel or series-parallel to provide the correct voltage. As much as possible, placing batteries in parallel ought to be avoided. When possible build the battery bank using batteries connected in series with each other.

The interconnecting DC wires must be sized and rated exactly the same as those that are used between the battery bank and Energizr. Place the batteries as close as practical to Energizr, preferably in an insulated and ventilated enclosure.

If using a non-JLM battery rack, allow adequate space above the batteries to access the terminals and vent caps (as applicable). Also allow at least 1" of space between the batteries to provide good air flow.

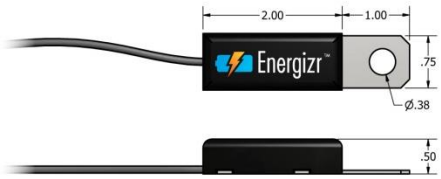
DO NOT mount the batteries directly under Energizr if the chemistry of the batteries requires venting of gasses from the batteries.

To ensure the best performance, batteries should be of the same size, type, rating and age. Do not use old or untested batteries.

CAUTION: Install batteries that require venting in a well-ventilated area. Batteries can produce explosive gases. For compartment/enclosure installations, always vent batteries to the outside.

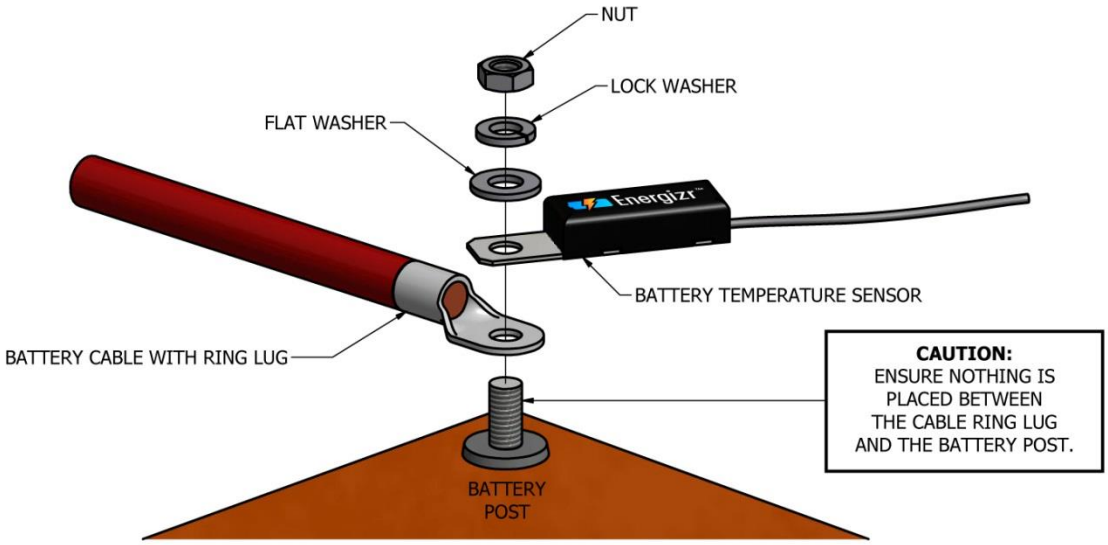
Wiring the Battery Temperature Sensor

The Battery Temperature Sensor (shown below) provides Energizr with precise battery temperature information to automatically adjust the battery charger's BULK, ABSORB and FLOAT voltage set points. This allows the batteries to be correctly charged under extreme temperature changes. If the temperature sensor is NOT installed and if the batteries are subjected to large temperature changes, the battery life may be shortened.



Battery Temperature Sensor

To install the Battery Temperature Sensor, attach the ring terminal end of the Battery Temperature Sensor to the negative battery terminal. See figure below for proper connection to the battery terminal.



Battery Temperature Sensor Wiring

Route the sensor's cable to Energizr following existing wire runs. Connect the RJ11 connector end of the BTS cable to the BTS port labeled on Energizr's front panel.

Wiring Energizr to the Battery Bank

CAUTION: Inverter is NOT reverse polarity protected. If this happens Energizr will be damaged and will not be covered under warranty. Before connecting the DC wires from the batteries to Energizr, verify the correct battery voltage and polarity using a voltmeter. If the positive terminal of the battery is connected to the negative terminal of Energizr and vice versa, severe damage will result. If necessary, color-code the cables (with colored tape): red for positive (+) and black for negative (-) to avoid polarity confusion.

DC Negative Wire

Route an appropriately sized DC negative wire (black) from the negative terminal of the battery bank to Energizr's negative terminal.

DC Positive Wire

Mount the circuit breaker or fused disconnect assembly as near as practical to the batteries and open the circuit breaker or fused disconnect.

WARNING: DO NOT close the DC circuit breaker or fused disconnect to connect battery power to the Energizr at this time. This will occur in the **Commissioning** process after the installation is complete.

CAUTION: If connecting live battery cables to Energizr's DC terminals, a brief spark or arc may occur; this is normal and due to Energizr's internal capacitors being charged.

Route and connect an appropriately sized DC positive wire (red) from Energizr's positive DC terminal to one end of the circuit breaker or fused disconnect.

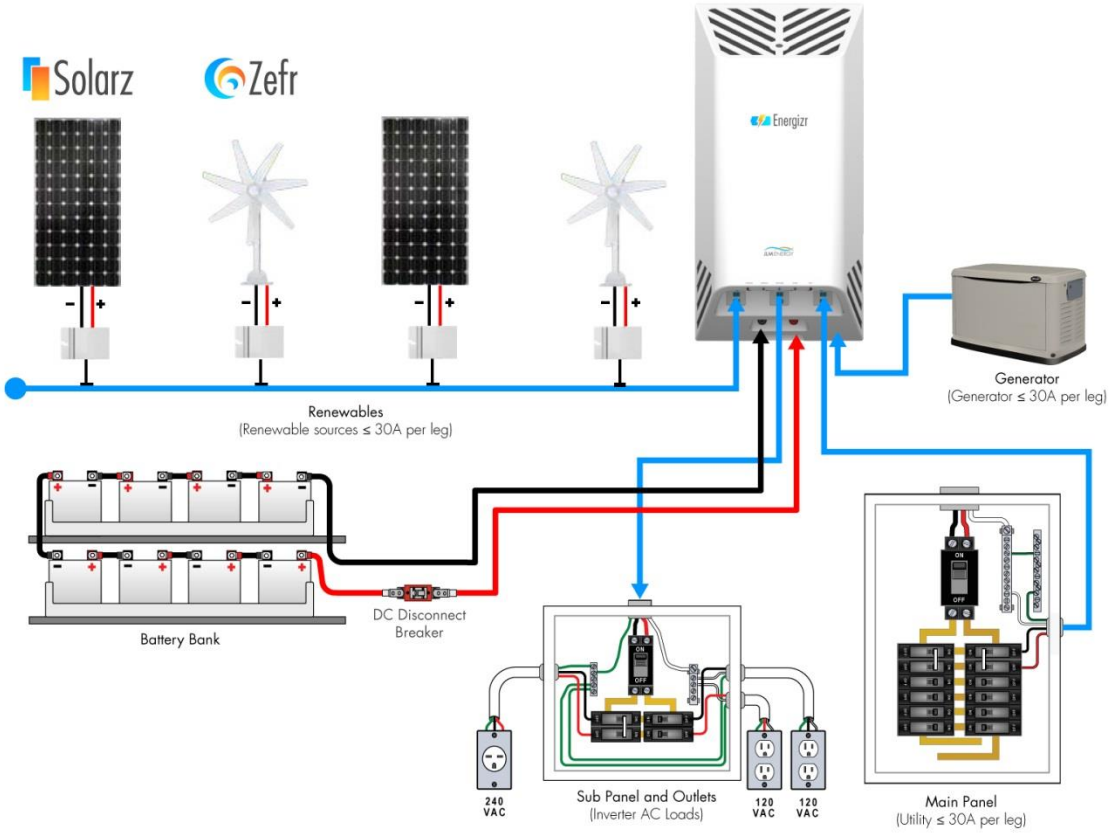
Connect a short wire (same rating as the DC wires) from the other side of the DC circuit breaker or fused disconnect to the positive terminal of the battery bank. This is essential to ensure even charging and discharging across the entire battery bank.
Ensure the DC wire connections (on the batteries, inverter and DC circuit breaker) are flush on the surface of the DC terminals and the hardware (lock washer and nut) used to hold these connections are stacked correctly. Verify all DC connections are torqued to 100 in-lbs. (11.3 Nm).

Once the DC connections are completely wired and tested, coat the terminals with an approved anti-oxidizing spray. Attach the red and black terminal covers over Energizr's DC connectors and secure them in place with the supplied screws.

If the batteries are in an enclosure, perform a final check of the connections to the battery terminals, then close and secure the battery enclosure.

2.2.3 AC Wiring

This section provides information on how to make the AC connections to Energizr using the correct AC wire size and corresponding overcurrent protection. Refer to the figure below.



Pre-AC Wiring Requirements

CAUTION: Before installing any AC wiring, review the safety information at the beginning of this manual and the following to ensure a safe and long-lived system:

- AC Loads powered by Energizr will need to be installed into an electrical panel.
- Read all instructions and cautionary markings located at the beginning of this manual and in the pre-installation section, before installing Energizr and batteries.
- Always use properly rated circuit-breakers. If using an electrical sub-panel, circuit breakers can be moved from the main electrical panel to the sub-panel only if the breakers are also listed to be installed in the sub-panel.
- AC wiring must be no less than #10 AWG (5.3 mm2) gauge copper wire and be approved for residential wiring per the NEC (THHN as an example).
- DO NOT connect Energizr's output to an AC power source.
- Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

AC Wire Size and Overcurrent Protection

The AC input and output wiring must be sized per the NEC and local electrical safety code requirements to ensure the wires' ability to safely handle Energizr's maximum load current. After determining the proper AC wire sizes, Energizr's AC input and output wires are required to be protected from short circuits and overloads by an overcurrent protection device and have a means to disconnect the AC circuits.

When in the Standby mode (Grid voltage is available and being used), the full AC continuous pass-through capacity of the Energizr is 30 amps for each AC leg (AC HOT 1 and AC HOT 2). To obtain the 30 amp continuous pass-through capability of Energizr, each AC HOT input to Energizr requires a 30 amp continuous duty rated double-pole breaker, which corresponds to a minimum cable size of #10 AWG in conduit. If you are using other wire sizes, refer to the appropriate electrical codes for circuit breaker requirements.

Overcurrent protection must be provided as part of the installation. The overcurrent protection device must be a circuit breaker or a fuse and be properly sized and branch circuit rated for the wire it is protecting and the appliances being powered.

The AC connectors are provided as 3-foot long pigtails using cables rated for non-conduit use on each of the four AC ports.

CAUTION: Energizr's internal AC transfer relay is rated for 30 amps (each leg), the pass-thru current must be no greater than 30 amps or damage to this relay may occur.

INFO: The breaker must be derated by 80% if not rated for continuous duty. The NEC requires that circuits are not to be operated continuously at more than 80% of rating unless listed with a 100% continuous rating.

INFO: Copper wire rated with 90°C insulation at an ambient temperature of 30°C 86°F).

Recommended GFCI (Ground Fault Circuit Interruption) Breakers
Some electrical safety codes require the use of GFCI's. In compliance with UL 943 standards, JLM Energy has tested the following GFCI's and find that they function properly when connected to Energizr's AC output:

- Shock Sentry #XGF15V-SP
- Leviton Smart Lock #8899-A
- Hubbell #GF520EMBKA

WARNING: Risk of electric shock. Use only the ground-fault circuit interrupter specified in this manual. Other types may fail to operate properly when connected to this inverter equipment.

AC Input and Output Wiring Connections
Energizr has four AC connectors located on its front panel:

1. Grid
2. Loads
3. Renewables
4. Generator (optional)

These connections are provided using pre-wired 4-conductor cabling with a 3-ft long pigtail. This provides the installer a simple and flexible method of installing the unit.

Wiring the AC Input and Output
The Energizr series provides 120/240VAC on the output, but the input may be wired either as a 120/240VAC input or a 120VAC input (to one input only) depending on your AC source. The AC output will continue to produce 120/240VAC with either the 120/240VAC or 120VAC input configuration.

WARNING: DO NOT connect 120VAC (same phase) to both AC HOT 1 IN and AC HOT 2 IN inputs. These inputs must be 180° out-of-phase (i.e. 120/240VAC). If you only have a 120VAC source, you may connect to either the AC HOT 1 IN or AC HOT 2 IN, but NOT to both or damage may occur.

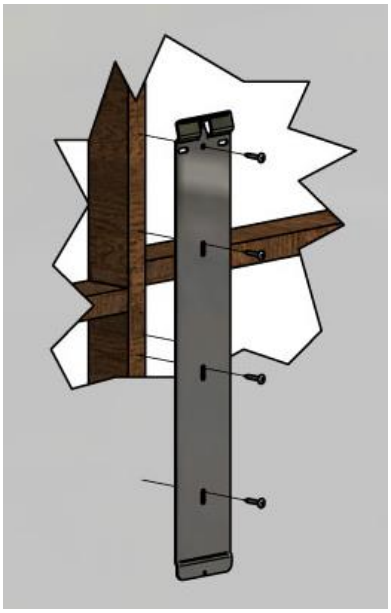
WARNING: Before making any AC connections, make sure that Energizr is disconnected from the battery bank and also all AC power is disconnected from Energizr.

CAUTION: Energizr's AC output must never be connected to an AC power source. This could cause severe damage to Energizr and is not covered under warranty.

2.2.4 Final Inspection

Gently pull on all wire connections to ensure they are securely held and ensure no bare wire is exposed. The AC input and output wiring in Energizr should be complete. Prior to reattaching the AC access cover, review all AC wiring to ensure all connections are correct and secure.

2.3 Installation



2.3.1 Installation of Energizr Mounting Plates

Notes:
-It is recommended to maintain a minimum clearance of 2” above the top edge of Energizr.
-It is recommended to maintain a minimum clearance of 2” below the battery rack.

-Overall height of Energizr and battery rack = 93 1/4”
-Overall height (minimum) of wall space needed for Energizr and battery rack = 97 1/4”

1. Mark a straight, vertical, and plumb line on the wall, directly in line with the center of the stud.

2. Hole #1 - Determine the height of the battery rack base above the floor and add 48 5/8” to that height. Mark the wall at this height.

Example: The battery rack base is to be mounted 2” above the floor.
Mark the wall at 50 5/8” above the floor.

3. Hole #2 – Measure 10 9/16” from the center of and above hole #1, then mark the wall.

4. Hole #3 – Measure 11 9/16” from the center of and above hole #1, then mark the wall.

5. Hole #4 – Measure 40 1/8” from the center of and above hole #1, then mark the wall.

***Pre-drill each of these 4 holes to ensure accuracy and to prevent broken fasteners.**

6. Mount the battery rack using a 3/8” x 3” lag bolt in the battery rack's top hole (Hole #1).

7. Mount the junction box mounting plate with (2) 1/4” x 3” lag bolts (Holes #2 & #3).

8. Mount the Energizr mounting plate with a 1/4” x 3” lag bolt in top center hole (Hole #4).

9. After the three mounting plates are hanging on the wall, line up the plumb line in the center of the remaining mounting holes and tighten the lag bolts already installed to prevent movement when installing the remaining fasteners.

***Pre-drill the remaining holes for each mounting plate to ensure accuracy and to prevent broken fasteners.**

10. Install and tighten (3) 3/8” x 3” lag bolts in the remaining mounting holes of the battery rack.

11. Install and tighten (3) 1/4” x 3” lag bolts in the remaining mounting holes of the Energizr mounting plate.

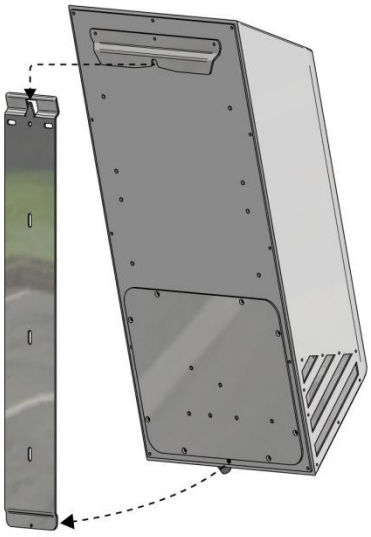
12. Installation of all mounting plates is complete.

*Simpson Strong-Tie Structural Screws (Model #SDS25300-R25) work very well for the installation of the Energizr and Junction Box mounting brackets. These screws also work well for pre-drilling the holes for the 3/8” battery rack mounting hardware.
After the Energizr mounting plate, the junction box mounting plate, and the battery rack are securely mounted to the wall in accordance with the Installation of Energizr Mounting Plates instructions, proceed to the Installation of Energizr instructions.

2.3.2 Installation of Energizr

INSTALLATION OF ANY AND ALL COMPONENTS OF ENERGIZR MUST BE PERFORMED BY QUALIFIED PERSONEL!

FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS MAY RESULT IN SERIOUS DAMAGE TO ENERGIZR AND MAY VOID THE WARRANTY!



1. Hook Energizr onto the top of the mounting plate and secure it with the included #10/32 x 1/2” machine screw at the bottom of the mounting plate.

Note: If using a JLM Energizr battery rack, proceed to Step 2.

If another battery source is being used, proceed to Step 19.

INFO: Check and ensure each battery terminal connection is torqued to 35 ft.-lbs. (47.4 Nm). These connections require the use of a 22mm. wrench or socket.

2. Install the batteries onto their corresponding shelves of the battery rack. Each group of batteries is labeled with a designated shelf.

-Shelf #1 is the bottom-most shelf in the battery rack.

-Shelf #4 is the top-most shelf in the battery rack.

3. Install the battery bus bars between each shelf of batteries with the included 1/4" hardware. These connections should be torqued to 100 in.-lbs. (11.3 Nm).

-Shelf #1 connects to Shelf #2 on the right side.

-Shelf #2 connects to Shelf #3 on the left side.

-Shelf #3 connects to Shelf #4 on the right side.

READ ALL OF STEP #4 BEFORE ACTING UPON THE INSTRUCTIONS!

4. Locate the white 4-pin or 6-pin connector and the white 2-pin connector at each battery shelf located in the Battery Management System (BMS) wiring harness. Each group of batteries has a 4-pin or 6-pin connector (battery voltage sense) and a white 2-pin connector (battery thermistor) attached to the batteries. Plug each set of connectors together on each battery shelf. These connectors are labeled with a number and connectors must be plugged together with like numbered connectors (#1 to #1, #4 to #4, etc.). **It is important to start with Shelf #1 and work your way up to Shelf #4.**

5. Connect the red positive battery cable from the battery solenoid to the positive battery post of the left-most battery on Shelf #4.

6. On the bottom of the black negative battery post that is located at the top of the battery rack, there is a black negative battery cable that runs down the back of the battery rack to Shelf #1. Connect this black negative battery cable to the 90° bus bar on the right-most battery's negative terminal on Shelf #1 using the included 1/4" hardware and torque to 100 in.-lbs. (11.3 Nm).

7. Connect the Battery Temperature Sensor (BTS) to the same bus bar connection that the black negative battery cable is attached to on Shelf #1.

Route the BTS data cable through the holes on the left side of the batter rack shelves to the top of the battery rack. Connect the BTS data cable to the bottom of the BTS port located on the top left of the battery rack. Any slack in the BTS cable can be neatly secured with a wire tie (zip tie) and tucked behind the batteries on Shelf #1.

8. Locate the two 6” long gray data cables that are included with each Energizr. Plug one of these cables into the BTS port located on the top left of the battery rack. The other end of that cable will plug into the BTS port on the bottom left of Energizr. The second gray data cable will plug into the Control port on the top left of the battery rack. The other end of that cable will plug into the Control port on the bottom left of Energizr.

9. Before installing the battery rack cover:
   -Press and hold the battery rack ON/OFF button (located on the top left of the battery rack) for 20-30 seconds until the battery solenoid can be heard closing. Immediately release the button after the solenoid is heard closing.
   -Measure the DC voltage between the red positive and black negative battery posts located on top of the battery rack. 48-50 VDC should be present at these terminals.
   -If proper DC voltage is not measured between the battery posts, check all of the connections inside the battery rack and on the batteries.
   -Locate the twisted 3-wire (red, black, white) harness that is attached to the Battery Management System (BMS). The loose end of the harness has a white 4-pin connector attached to it. Lay this harness on top of the batteries on Shelf #4 for use in Step 11. Locate the gray data cable that is plugged into the bottom of the Control port on the top left of the battery rack. Lay this harness on top of the batteries on Shelf #4 for use in Step 11.

10. Install the battery rack cover using the included hardware.

11. Locate the Remote Controller that mounts into the top of the battery rack.
   -The Remote Controller has a twisted 3-wire (red, black, white) harness tied to the mounting plate. This harness has the matching white 4-pin connector to the BMS twisted 3-wire harness (Step 9). Plug these two connectors together.
   -Plug the gray data cable from the Controller port on the battery rack (Step 9) into the port on the back side of the Remote Controller.
   -The Remote Controller mounting plate can now be mounted into the top of the battery rack with the included hardware.

12. The twisted 3-wire (red, black, white) harness that is now exposed out of the top of the Remote Controller panel has bare wire ends at the end of the harness. This harness will be addressed in Step 16.

13. Locate the 6” long red positive battery cable and the 6” long black negative battery cable included with each Energizr.

ENSURE THE BATTERY MANAGEMENT SYSTEM (BMS) IS TURNED OFF!
NO DC VOLTAGE SHOULD BE MEASURED BETWEEN THE BLACK NEGATIVE AND RED POSITIVE BATTERY POSTS ON TOP OF THE BATTERY RACK!

FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY TO THE INSTALLER AND TO ENERGIZR WHICH MAY VOID THE WARRANTY!

14. Connect the red positive battery cable between the red battery posts on top of the battery rack and on the bottom of Energizr. Connect the black negative battery cable between the black battery posts on top of the battery rack and on the bottom of Energizr. Install the included battery terminal covers on Energizr's battery posts.

15. Mount the Energizr junction box to the junction box mounting plate and the top of the battery rack with the included hardware. Route the blue cables from the bottom of Energizr through the appropriate holes in the top of the junction box.

16. There is a twisted 3-wire (red, black, white) harness that is terminated at a 3-position terminal strip and routed through the back of the junction box. At the other end (outside of the junction box) of the 3-wire harness, each of the wires is terminated into a green 3-pin plug. Terminate the twisted 3-wire harness from the battery rack (routed through the Remote Controller mounting plate in Step 12) at this 3-position terminal strip, matching the wires color for color (red to red, black to black, white to white). Insert the green plug into the Anemometer port located on the bottom left of Energizr.

17. Route the GRID circuit conductors, LOADS circuit conductors, RENEWABLES circuit conductors (if available), and the GENERATOR circuit conductors (if available) into the junction box. Properly and securely connect these conductors to the conductors in the blue cables routed from the bottom of Energizr into the junction box. Terminate all green ground conductors to the ground bar mounted inside the junction box.

INFO: With the junction box mounted in place, it may be difficult to see the labeling for the blue cables coming from the bottom of Energizr.

Left Front Cable: RENEWABLES
Center Front Cable: LOADS
Right Front Cable: GRID
Right Rear Cable: GENERATOR (if generator option is present)

18. Install the junction box cover with the included hardware.

INSTALLATION OF ENERGIZR IS NOW COMPLETE

If a battery source, other than the JLM Energizr battery rack, is being used, the following steps must be performed.

19. Included with each Energizr is a 6” long red 22 AWG wire with a green 3-pin connector attached to one end and a ring terminal attached to the other end. Connect the ring terminal to the red positive battery post on the bottom of Energizr. Plug the green 3-pin connector into the Anemometer port on the bottom left of Energizr.

ENSURE THE DC BATTERY VOLTAGE IS TURNED OFF BEFORE PROCEEDING!

FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY TO THE INSTALLER AND TO ENERGIZR WHICH MAY VOID THE WARRANTY!

18. Connect the red positive battery cable from the battery source to the red battery post on the bottom of Energizr. Connect the black negative battery cable from the battery source to the black battery post on the bottom of Energizr. Install the included battery terminal covers on Energizr’s battery posts.
19. Route the blue cables from Energizr into an appropriate junction box in accordance with the National Electric Code (NEC) and local code.

20. Route the GRID circuit conductors, LOADS circuit conductors, RENEWABLES circuit conductors (if available), and the GENERATOR circuit conductors (if available) into the junction box previously installed in Step 19. Properly and securely connect these conductors to the conductors in the blue cables from Energizr. Terminate all green ground conductors in accordance with the NEC and local code.

INSTALLATION OF ENERGIZR IS NOW COMPLETE

2.4 Commissioning

IT IS STRONGLY ADVISED THAT A COMPUTER WITH THE CONTROLRZ PROGRAM BE ON HAND AT THE TIME OF ENERGIZR COMMISSIONING FOR USE IN CONFIGURATION OF SETTINGS WITHIN ENERGIZR THAT MAY BE UNIQUE TO A CERTAIN INSTALLATION, AND TO PREVENT POSSIBLE DAMAGE TO ENERGIZR OR SYSTEM COMPONENTS!

THE COMMISSIONING PROCEDURES FOR ENERGIZR MUST BE PERFORMED BY QUALIFIED PERSONEL!

FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS MAY RESULT IN SERIOUS DAMAGE TO ENERGIZR AND MAY VOID THE WARRANTY!

1. Ensure all wiring connections are completed and the following are in the **OFF** position:
    -Energizr main power switch (on the right side of the Energizr)
    -AC GRID voltage
    -DC BATTERY voltage
    -LOADS sub-panel
    -RENEWABLES system
    -GENERATOR system (if applicable)

2. Prior to turning on Energizr, make sure all AC loads in the LOADS sub-panel are **NOT** connected (circuit breakers in the **OFF** position) to Energizr, ensuring that there are **NO** loads connected to Energizr's output at this point of the commissioning process.

3. If using a JLM battery rack: Turn on the battery rack by pressing the battery on/off button (on the top left of the battery rack) for 20-30 seconds until the battery contactor can be heard closing. When the contactor is heard closing, release the battery button within 3 seconds or the battery contactor will reopen and the start procedure for the battery rack must be performed again. Verify proper battery voltage (nominal 48 VDC) and polarity (red = positive, black = negative) at the battery posts on top of the battery rack.
If another battery source is being used: Place the DC disconnect or circuit breaker between Energizr and the batteries in the ON position. Verify proper battery voltage (nominal 48 VDC) and polarity (red = positive, black = negative) at the battery posts on the bottom of Energizr.

AT THIS POINT, THE GRID AC VOLTAGE IS <u>NOT</u> TO BE TURNED ON TO THE ENERGIZR!

4. Switch the Energizr's main power switch (on the right side of the Energizr) to the ON position. The green SYSTEM LED on the front of the Energizr will turn on within 10 seconds (if it does not, turn OFF Energizr's main power switch, and repeat Step 4). The green SYSTEM LED will turn off after another 10 seconds. It is now safe to proceed to Step 5.

5. Lightly press and release the Energizr's ON/OFF push button to turn the Energizr on. It is located on the right side of the Energizr, next to the main power switch. Early versions of Energizr may have this button located on top of the Energizr. Within 5 seconds, the yellow INVERTING LED on the front of the Energizr will turn on. The Energizr is now turned on.

6. Connect a 10 watt or greater light bulb (e.g., shop or drop light) to the LOADS output. This light can be connected to the LOADS sub-panel on an appropriately sized circuit breaker. At this point, voltage can be confirmed at the LOADS sub-panel bus bars.

INFO: Energizr's AC output voltage will not be correct at the LOADS sub-panel until a greater than 5 watt load (5 watts is the default setting) is connected to the Energizr, or the "Wait" mode is turned OFF with a remote display (on a JLM battery rack). The 10 watt or greater light bulb is used because it is a sufficient load to bring the Energizr out of "Wait" mode and supply full voltage to the LOADS sub-panel.

The use of a 10 watt or greater light bulb ensures that the loads within the home or building are protected and not at risk of damage or failure during this test procedure.

Check the AC output voltage of the Energizr by connecting an AC voltmeter to the LOADS sub-panel. Verify the correct output voltages. If 120 volts AC are measured on both Phases to Neutral and/or Ground, and 240 volts AC are measured between both Phases of the Energizr output, proceed to Step 7.

7. Turn ON the GRID AC voltage to the Energizr. After the GRID AC voltage to the Energizr is qualified (approximately 60-70 seconds), the Energizer will stop inverting power from the batteries, the incoming GRID AC voltage will transfer through the Energizr to the LOADS sub-panel, and the 10 watt or greater light bulb will now be powered by the GRID and not the batteries. The green SYSTEM LED on the front of the Energizr will now be turned ON.

INFO: At this point, the red CHARGING LED on the front of the Energizr may or may not be lit. The state of charge of the batteries will dictate whether or not the charger is turned on and charging the batteries. The red CHARGING LED may be solid or blinking, depending on the type of charging status the charger is in. See Section 3.8 LED Operation. Check the AC output voltage of the Energizer by connecting an AC voltmeter to the LOADS sub-panel. Verify the correct output voltages. If 120 volts AC are measured on both Phases to Neutral and/or Ground, and 240 volts AC are measured between both Phases of the Energizer output, proceed to Step 8.

8. With the 10 watt or greater light bulb turned on, turn OFF the GRID AC voltage to the Energizr. The Energizr will switch to the batteries and supply inverted power to the LOADS sub-panel. Verify that the 10 watt or greater light bulb remains on. Once again, check the AC output voltage of the Energizr by connecting an AC voltmeter to the LOADS sub-panel. Verify the correct output voltages. If 120 volts are measured on both Phases to Neutral and/or Ground, and 240 volts are measured between both Phases of the Energizr output, proceed to Step 9.

9. Turn ON the GRID AC voltage to the Energizr and wait for the Energizr to connect to the grid (approximately 60-70 seconds). The green SYSTEM LED and the blue RENEWABLES LED on the front of the Energizr will be lit.

With the RENEWABLES system (string inverter or micro-inverters) turned **OFF**, check the RENEWABLES AC output voltage of the Energizer at the connection between the Energizer and the RENEWABLES system (disconnect or circuit breaker). Verify the correct output voltages. If 120 volts AC are measured on both Phases to Neutral and/or Ground, and 240 volts AC are measured between both Phases of the Energizr output, proceed to Step 10.

10. Turn ON the RENEWABLES system.

-If using the Controlrz program with a computer connected to the Energizr, you will be able to see the RENEWABLES system operating after it turns ON and produces power.

-If **NOT** using the Controlrz program with a computer connected to the Energizr:

-A string inverter with a status display will indicate whether or not the RENEWABLES system is operating.

-If a micro-inverter system is being used, there are three methods of visually verifying that the RENEWABLES system is operating. **First**, with little to no load on the Main Electrical Panel, you should be able to see the service meter running backward if the RENEWABLES system is operating. **Second**, if the micro-inverters have system status LED indicators, refer to the micro-inverter manufacturer for LED Operation. **Third**, if the micro-inverter system has a monitoring system, refer to this monitoring system for micro-inverter system operation.

INFO: The blue RENEWABLES LED on the front of the Energizr is lit any time the Energizr is ready to be connected to a RENEWABLES system. The blue RENEWABLES LED being lit does not specifically mean that the RENEWABLES system is operating.

At this point, GRID AC voltage is on, the RENEWABLES system is on and producing power, and the Loads sub-panel has the correct AC voltage.

11. Turn the GRID AC voltage to the Energizr off. The green SYSTEM LED on the front of Energizr will not be lit. The 10 watt or greater light bulb on the Loads sub-panel should still be turned on because the Energizr is now using inverted battery voltage to provide power to the Loads sub-panel. The RENEWABLES system inverter(s) will turn off and restart in 5 minutes (per UL 1741 specifications).

INFO: If the batteries have a state of charge above 85%, Energizr will not allow the RENEWABLES system to turn on (when GRID voltage is not present) and the blue RENEWABLES LED will not be lit. Inverted battery power will supply AC voltage to the Loads sub-panel until the batteries reach a state of charge below 65%. At that time, Energizr will allow the RENEWABLES system to turn on. With the RENEWABLES system turned on and producing power, the Loads sub-panel will be fed AC voltage from the RENEWABLES system. The batteries will also charge from the power being supplied by the RENEWABLES system. Energizr will allow the RENEWABLES system to remain on until the batteries reach 85% state of charge, at which point Energizr will turn off its internal RENEWABLES relay, causing the RENEWABLES to turn off. This is a safety feature of Energizr that prevents the overcharging of the batteries from the RENEWABLES system when GRID voltage is not present.

If the blue RENEWABLES LED is not lit and the RENEWABLES relay is open, loads must be turned ON in the LOADS sub-panel in order to reduce the battery state of charge below 65%. If a large enough load (3.5 - 4.4 KW) is turned ON in the LOADS sub-panel, the RENEWABLES relay may close before the battery state of charge reaches 65% or lower. Energizr does this to allow renewable energy to power the heavy loads. Space heaters are a great load source when attempting to reduce the battery state of charge.

Verify that the RENEWABLES system turns back on. Once it is confirmed that the RENEWABLES system turns back on and is producing power, with GRID AC voltage OFF, proceed to Step 12.

12. Turn the GRID AC voltage to the Energizr back on. The green SYSTEM LED on the front of Energizr will be lit (after 60-70 seconds). The RENEWABLES system inverter(s) will turn off and restart in 5 minutes (per UL 1741 specifications). Verify that the RENEWABLES system turns back on. Once it is confirmed that the RENEWABLES system turns back on and is producing power, with GRID AC voltage on, proceed to Step 13A or 13B.

13A. If a generator system **IS NOT** being used, ensure that the GRID AC voltage, the LOADS sub-panel circuit breakers, the RENEWABLES system, and the Energizr itself are turned ON.

The testing procedures for Energizr are now complete.

If Energizr has passed all of these steps, Energizr is ready for use.

13B. If a non-automatic start generator system is being used, proceed to Step 14.

If an automatic start generator system is being used, proceed to Step 17.

Note: If the RENEWABLES system is producing enough power to supply all the loads in the LOADS sub-panel **AND** keep the battery state of charge above a preset level (factory default setting is 40%), Energizr will not attempt to connect to the generator.

If the RENEWABLES system is not producing enough power to supply all the loads in the LOADS sub-panel (low light, low wind, night time, etc.) and the batteries reach a preset state of charge (factory default setting is 40%), Energizr will attempt to connect to the generator.

14. BEFORE CONNECTING A NON-AUTOMATIC START GENERATOR TO ENERGIZR:

-Turn the GRID connection to Energizr and the RENEWABLES system OFF.

-Start the generator.

-Check the AC output voltage of the generator by connecting an AC voltmeter to the output of the generator. Verify the correct output voltages. 120 volts AC must be measured on both Phases to Neutral and/or Ground, and 240 AC volts must be measured between both Phases of the generator output.

-If the correct voltages are verified on the generator output, turn **OFF** the generator, and

connect the generator output to the Energizr GENERATOR connection.

15. With the GRID AC voltage to Energizer turned **OFF**, the 10 watt or greater light bulb connected to the LOADS sub-panel will be lit because the Energizr is supplying inverted power from the batteries to the LOADS sub-panel. The green SYSTEM LED on the front of the Energizr will not be lit.

The Energizr will continue to power the LOADS sub-panel and **WILL NOT** allow generator power to be used until the batteries reach a preset state of charge (factory default setting is 40%). When the batteries reach a preset state of charge (factory default setting is 40%), the Energizr will attempt to connect to the generator. Since the generator must be manually started, the Energizr will not sense voltage on the generator connection and will go into a FAULT mode, turning the red FAULT LED on the front of the Energizr ON. At this point, the following steps must be taken:

-Start the generator and put the generator output switch, disconnect, or circuit breaker in the ON position.

-Reset the Energizer. Lightly press and release Energizr's on/off push button. Wait for Energizr to turn OFF. Turn the main power switch (on the right side of the Energizr) OFF. Wait 30 seconds. Turn the main power switch back to the ON position. The green SYSTEM LED on the front of the Energizr will turn ON within 10 seconds. Wait for the green SYSTEM LED will turn OFF after another 10 seconds.

-Lightly press and release Energizr's on/off push button (on the right side of the Energizr, next to the main power switch, or on top of the Energizr for earlier versions) to turn the Energizr ON.

Energizr will qualify the generator power (approximately 60 seconds) and the green SYSTEM LED on the front of the Energizr will turn ON, indicating Energizr is sending AC voltage from the generator to the LOADS sub-panel. The 10 watt or greater light bulb will now be lit by generator power.

If the batteries reach a preset state of charge (factory default setting is 40%), and Energizer connects to the generator, in addition to the green SYSTEM LED being lit, the red CHARGING LED on the front of Energizr will turn ON, indicating the batteries are being charged by the generator. When the batteries are completely charged by the generator, Energizr will disconnect from the generator output and send inverted AC voltage to the LOADS sub-panel. At this time the red CHARGING LED will turn OFF and the batteries will be fully charged.

-The generator must be manually turned off at this point.

16. Ensure that the GRID AC voltage, the LOADS sub-panel circuit breakers, the RENEWABLES system, and Energizr itself are turned ON.

The testing procedures for Energizr are now complete.

If Energizr has passed all of these steps, Energizr is ready for use.

17. BEFORE CONNECTING AN AUTOMATIC START GENERATOR TO ENERGIZR:

-Turn the GRID connection to Energizr and the RENEWABLES system OFF.

-Start the generator.

-Check the AC output voltage of the generator by connecting an AC voltmeter to the output of the generator. Verify the correct output voltages. 120 volts AC must be measured on both Phases to Neutral and/or Ground, and 240 AC volts must be measured between both Phases of the generator output.

-If the correct voltages are verified on the generator output, turn **OFF** the generator, and connect the generator output to the Energizr GENERATOR connection.

Energizr has an internal relay with dry contacts that may be used for the automatic start function of a generator. Please consult with your JLM representative to ensure your automatic start generator is compatible with Energizr's automatic start feature.

With the GRID AC voltage to Energizer turned OFF, the 10 watt or greater light bulb connected to the LOADS sub-panel will be lit because Energizr is supplying inverted power from the batteries to the LOADS sub-panel. The green SYSTEM LED on the front of the Energizr will not be lit.

Energizr will continue to power the LOADS sub-panel and **WILL NOT** allow generator power to be used until the batteries reach a preset state of charge (factory default setting is 40%). When the batteries reach a preset state of charge (factory default setting is 40%), Energizr will attempt to connect to the generator. The automatic start relay inside Energizr will close, telling the generator's automatic start system that the generator can now start.

When the generator starts, Energizr will qualify the generator power (approximately 60 seconds) and the green SYSTEM LED on the front of the Energizr will turn ON, indicating Energizr is sending AC voltage from the generator to the LOADS sub-panel. The 10 watt or greater light bulb will now be lit by generator power.

If the batteries reach a preset state of charge (factory default setting is 40%), and Energizer connects to the generator, in addition to the green SYSTEM LED being lit, the red CHARGING LED on the front of Energizr will turn ON, indicating the batteries are being charged by the generator. When the batteries are completely charged by the generator, Energizr will disconnect from the generator output. Energizr will also open the internal automatic start relay, telling the generator's automatic start system to turn the generator off. Once disconnected

from the generator, Energizr will send inverted AC voltage to the LOADS sub-panel. At this time the red CHARGING LED will turn OFF and the batteries will be fully charged.

18. Ensure that the GRID AC voltage, the LOADS sub-panel circuit breakers, the RENEWABLES system, the GENERATOR automatic start system, and the Energizr itself are turned ON.

The commissioning procedures for Energizr are now complete.

If Energizr has passed all of these steps, Energizr is ready for use.

3.0 Operation

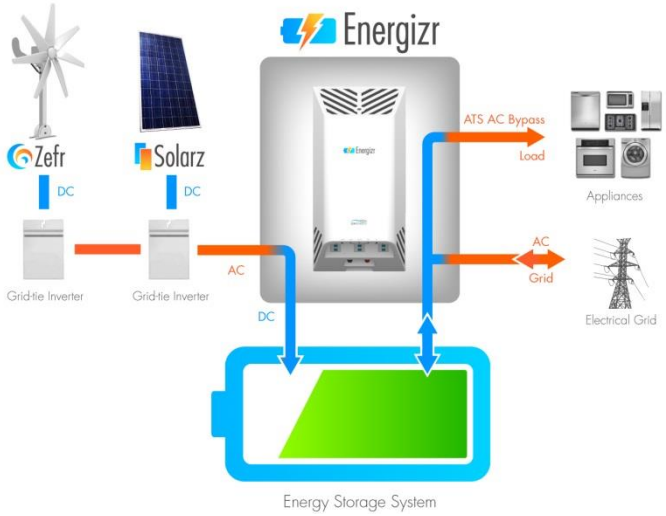
3.0 Operation

The table shown on the next page shows the 12 valid operating conditions for the Energizr. The two main operating modes are:

1. ***Inverter Mode (State #5):*** Powers loads using the batteries
2. ***Standby Mode (State #11):*** Transfers the incoming AC Power (i.e. utility power or a generator) to power loads and uses this incoming power to recharge the batteries.

If renewable energy, that is PV Solar or Zefr wind turbines are available, the energy produced by them is either used to charge the batteries or sent to power loads or simply used for net metering when connected in Standby Mode (i.e. the grid is present).

The next four energy flow diagrams depict some of the examples of the 12 different valid operating conditions.

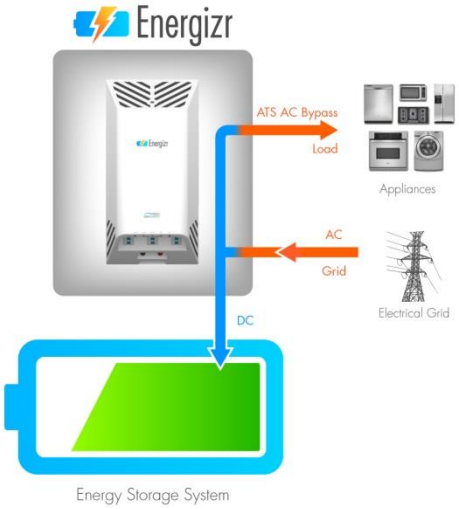


State #12

Power Flow - Standby Mode

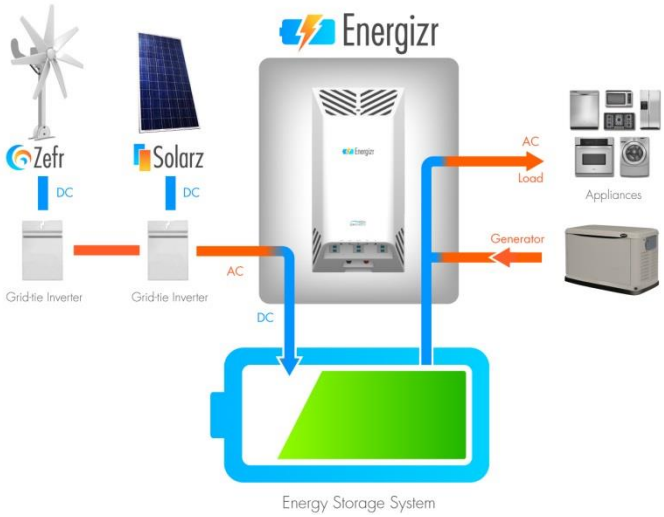
						Meausured and Set Parameters	Main On/Off Switch. User-operated	Any System fault:	AC Input and Generator input Relays	RE Relay and AC RE current flow	AC Output Relay and AC Load current Measurement	Measure sign of current flow in the Battery
						Definition of "ON"	On: Connected but not activity	Battery below Min SOC	On: grid ON and generator off	On: RE are connected	On: Loaded	On: Fully Charged
						Definition of "OFF"	Off: Not connected	VAC outside limits	Off: grid & generator off	OFF: RE disconnected	OFF: Not loaded	OFF: Discharging
						Definition of "Blinking"	blinking: Working	Freq outside limits, etc.	Blinking: generator on and grid off	Blinking: RE Harvesting	blinking: There is Pmin Power outflow on the AC	Blinking: charging i.e.net battery current is positive
State #	**Grid**	**Load**	**RE**	**Gen.**	**State**		**ON/OFF LED**	**Fault**	**System**	**RE**	**Inverting**	**Charging**
1	OFF	OFF	OFF	OFF	System OFF		1	0 or 1	0	0	0	0
2	OFF	OFF	OFF	ON	Battery Charging from the Generator		0.5	0 or 1	0.50	0	0	0.5 or 1
3	OFF	OFF	ON	OFF	Battery Charging form the RE		0.5	0 or 1	0	0.5	0	0.5 or 1
4	OFF	OFF	ON	ON	Battery Charging form the Gen and RE		0.5	0 or 1	0.5	0.5 or 1	0	0.5 or 1
5	OFF	ON	OFF	OFF	Loads Served by the batteries only		0.5	0 or 1	0	0	0.5 or 1	0
6	OFF	ON	OFF	ON	Loads Served by the Generator, Generator also charging batteries		0.5	0 or 1	0.5	0	1	AoA
7	OFF	ON	ON	OFF	Loads Served by the RE and batteries		0.5	0 or 1	0	0.5 or 1	0.5 or 1	AoA
8	OFF	ON	ON	ON	Loads Served by the Gen, RE and batteries		0.5	0 or 1	0.5	0.5 or 1	1	AoA
9	ON	OFF	OFF	OFF	Grid Charging batteries		0.5	0 or 1	1	0	0	0.5 or 1
	ON	OFF	OFF	ON	Not a Valid State (Gen and Grid can not be on at the same time)		NA	NA	NA	NA	NA	NA
10	ON	OFF	ON	OFF	Grid and RE Charging Batteries		0.5	0 or 1	1	0.5 or 1	0	0.5 or 1
	ON	OFF	ON	ON	Not a Valid State (Gen and Grid can not be on at the same time)		NA	NA	NA	NA	NA	NA
11	ON	ON	OFF	OFF	Grid Running loads and charging batteries		0.5	0 or 1	1	0	1	0.5 or 1
	ON	ON	OFF	ON	Not a Valid State (Gen and Grid can not be on at the same time)		NA	NA	NA	NA	NA	NA
12	ON	ON	ON	OFF	Grid and RE running loads and charging batteries		0.5	0 or 1	1	0.5 or 1	1	0.5 or 1
	ON	ON	ON	ON	Not a Valid State (Gen and Grid can not be on at the same time)		NA	NA	NA	NA	NA	NA

On= 1, Off=0, Blinking: 0.5, AoA: All of Above



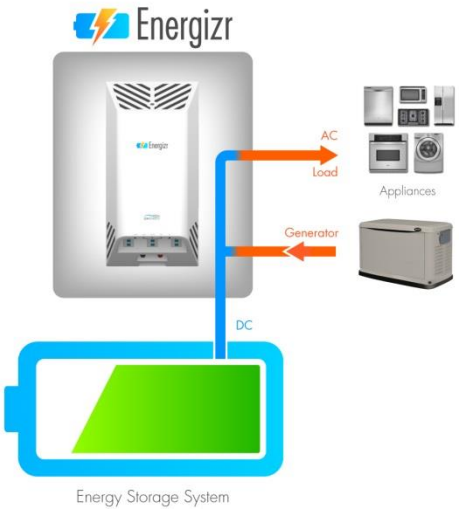
State #11

Power Flow - Inverter Mode



State #8

Power Flow - Standby Mode



State #6

Power Flow - Inverter Mode

3.1 States of Operation

State #1:
When Energizr is OFF, no power is used from the batteries to power the AC loads and the ON/OFF LED (surrounding the main ON/OFF button) will be ON (solid Blue). All other LEDs will be off. If a fault condition occurred during boot up, the Fault LED will be turned on.

The momentary ON/OFF power button (item 1; see figure in section 1.2) must be lightly pressed and held for at least 2 seconds to turn Energizr ON. Subsequently, pressing this button alternately turns Energizr OFF and ON.

When Energizr is first turned ON, Energizr attempts to qualify the following energy sources in this order:

1. AC Grid input. **(States #11 and #9)** Energizr measures the Grid voltage and frequency. If these two parameters are within the pre-specified range, the Grid input relay is closed followed by the Load output relay. This results in energy flow directly from the AC input to the loads connected to the system (e.g. electrical appliances) and the battery bank. **This is State #11**. In addition, if the output Load relay is opened, the system continues to charge the batteries. **This is State #9.**

2. Battery Bank: **(State #5)** If AC Grid input is not available, then the system attempts to qualify the battery storage system. If the battery SOC (state of Charge) is above the specified low limit, then the Energizr begins inverting and supplying energy to the loads using the energy in the battery bank.
3. Generator Input: If neither the AC Grid input nor the battery qualify, assuming that the system is equipped with an external generator and that the external generator's automatic starting is enabled, Energizr starts the generator and begins to monitor its voltage and frequency. Once the voltage and frequency stabilize and are within the specified limits, the generator relay is closed and energy begins to flow from the generator to the load and the batteries. **This is State #6**. If the Load relays are opened, then the generator continues to charge the Battery Bank. **This is State #2**.
4. If none of the above conditions are satisfied, Energizr would go back to System Off Mode **(State #1)** and the Fault LED would be turned on. If left in this state, Energizr continues to try the above routine every five minutes.

In any of the above 3 States, once the AC output of the system is stabilized and qualified, assuming that the Renewable Energy (RE) input of the system is enabled, the system closes the RE relay. This will result in the following State transitions:

State #5 → State #7
State #6 → State #8
State #9 → State #10
State #11 → State #12

If the battery is qualified as an energy source but system is not loaded, assuming that the RE input is enabled, the RE is used to charge the battery bank. **This is State #3.** By the same token, if the system is not loaded, but the generator is a qualified energy source, and RE energy is available, the energy generated by the generator will be used to charge the battery bank. **This is State #4.**

If the load is being powered by the battery bank and the amount of power flowing out of the AC Load port is more than the programmed ***Pmin*** (minimum set at the software interface; ***Pmin*** is set to 5 watts at the factory), then Energizr will begin inverting. The amount of time Energizr can be inverting and provide power is directly related to the amount of AC loads that are connected and the capacity of the battery bank. **This happens in State #5 and #7.**

Energizr's AC input can be powered by the Grid or by an external generator. If the AC input is active and powered by the Grid **(State #9 through #12)** then the green System LED would be turned on. If the AC input is powered by an external generator **(States #2, 4, 6 and 8)**, then the System LED flashes once every 2 seconds.

3.2 Battery Charging

Energizr is equipped with an active PFC (Power Factor Corrected) and PI (Proportional-Integral) multistage battery charger. The PFC feature is used to control the amount of power used to charge the batteries in order to obtain a power factor as close as possible to 1.

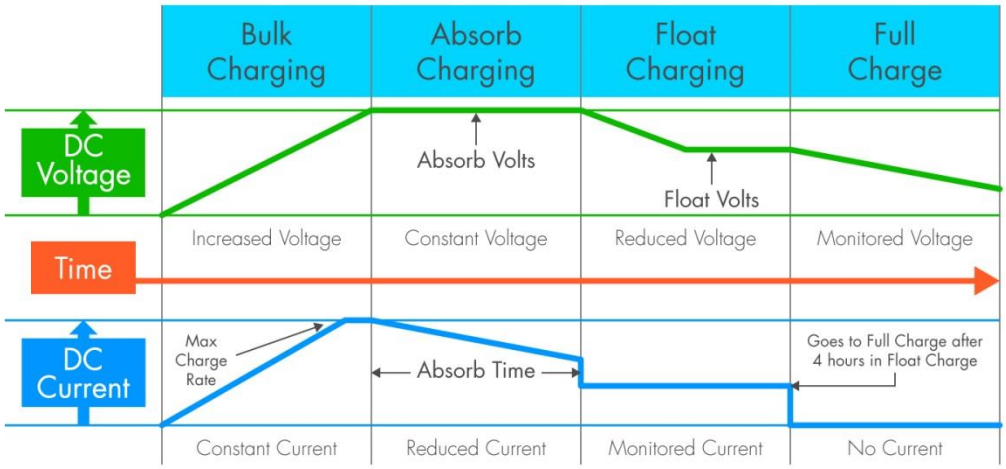
This causes the battery charger to look like a resistor to the line (forces the charge current wave shape to mirror the voltage wave shape). The PI feature allows the charger voltage and current to change independently. These two features maximize the real power available from either utility or generator AC power sources, which translates into less power wasted and greater charging capabilities than most chargers available today.

When an AC source is connected to the AC input, Energizr begins monitoring for acceptable AC voltage. Once Energizr has accepted this AC voltage, the AC transfer relay closes and the Charge Mode begins.

In Charge Mode, the DC voltage is monitored to determine the charging stage. If the DC voltage is less than 51.2 VDC, the charger begins Bulk Charging.

If the DC voltage is larger than 51.2 VDC, the charger will skip the Bulk and Absorb charging stages and goes directly to Float Charging.

The multistage charger can use up to five different charging stages to help monitor and keep the batteries healthy. The five stages of charging include an automatic 4-stage charging process: ***Bulk, Absorb, Float and Full Charge***; and a manual ***Equalization*** (EQ) charge stage. The automatic 4-stage charge process provides complete recharging and monitoring of the batteries without damage due to over-charging.



Automatic 4-Stage Charging Graph

Bulk Charging:
This is the initial stage of charging. While Bulk Charging, the charger supplies the battery with controlled constant current. The charger will remain in Bulk charge until the Absorption charge voltage (determined by the Battery Type selection) is achieved. Energizr's Charging LED blinks every 2 seconds to indicate the net current flow into the batteries is positive.

Absorb Charging:
This is the second charging stage and begins once the absorb voltage has been reached. Absorb Charging provides the batteries with a constant voltage and reduces the DC charging current in order to maintain the absorb voltage setting. Energizr's Charging LED flashes once every second to indicate absorption charging for 2 hours (determined by the Battery AmpHrs selection), then switches to Float Charging.

Float Charging:
The third charging stage occurs at the end of the Absorb Charging time. While Float charging, the charge voltage is reduced to the float charge voltage. In this stage, the batteries are kept fully charged and ready if needed by Energizr. Energizr's Charging LED flashes once every 1/2 second to indicate float charging. The float charging stage reduces battery gassing, minimizes watering requirements (for flooded batteries) and ensures the batteries are maintained at optimum capacity.

Full Charge (Battery Saver™ mode):
The fourth stage occurs after four hours in the float charging stage. The Full Charge stage is designed to keep batteries fully charged over long periods and prevent excessive loss of water in flooded batteries or drying out of GEL/AGM batteries. In this stage the charger is turned off and begins monitoring the battery voltage; if the battery voltage drops to 50.8 VDC or less, the charger automatically initiates another four hours in Float Charge. While in the Battery Saver Mode, Energizr's Charging LED is On.

Info: If the battery voltage falls to the re-bulk voltage (48.4VDC) or lower, the unit will begin another Bulk charge.

The battery settings in the Energizr Series are changeable and leave the factory with default values shown in the table below. These default values are adequate for most installations, however, if you determine that some of the values need to be changed for your particular system, these values may be adjusted at the factory.

Battery Turn on/off Levels	24 VDC Battery	48 VDC Battery
High Bat Cut Out	>33.8	>67.6
High Bat. Cut In	33.2	66.4
Low Bat Cut In	25.0	50
Low Batt Cut Out (1 minute delay)	20.0 (adjustable between 18 to 24.4 V at the factory)	40 (adjustable between 36 to 48.8 V at the factory)
Low Batt Cut Out (no delay)	17	34

The EQ stage, which requires Energizr Controller (Option-009), enables Equalization Charge which is used to stir up the batteries' stratified electrolyte. Equalization reverses battery plate sulfation that may have occurred.

3.3 Battery Temperature Sensor Operation

The plug-in Battery Temperature Sensor (BTS) is used to determine the battery temperature. This information allows the multistage battery charger to automatically adjust the battery charge voltages for optimum charging performance and longer battery life.

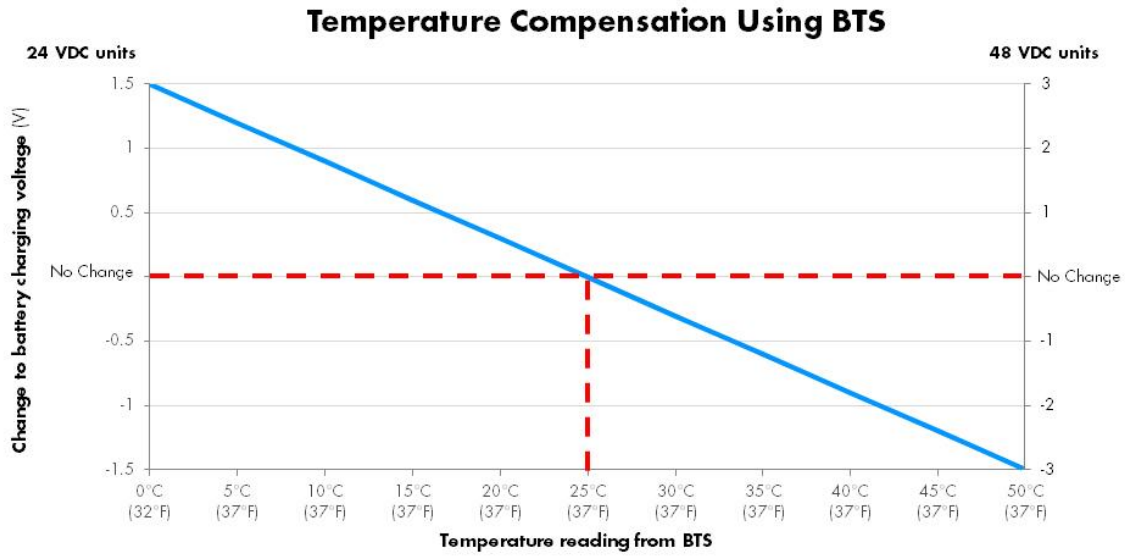
When the Battery Temperature Sensor is installed, the charge voltage while in the Bulk, Absorb or Float charge mode will either increase or decrease if the battery temperature is greater or lower than 77°F (25°C).

If the temperature around the sensor is below 77°F (25°C) the charge voltage increases and if the temperature is higher than 77°F (25°C), the charge voltage decreases. The further the temperature changes from 77°F (25°C), the greater the change in the charging voltage.

The figure below should be used to determine how much the charge voltage changes (increases or decreases) depending on the temperature reading of the sensor. For example, the nominal Absorb charge voltage for a flooded battery at 77°F (25°C) on a 24-volt model is 29.2VDC. If the battery temperature is 95°F (35°C), the Absorb charge voltage would decrease to 28.6VDC (29.2 nominal - 0.6 change).

If the temperature sensor is NOT installed, the charge voltages will not be compensated and charges at a temperature of 77°F (25°C). Without the sensor installed, the life of the batteries may be reduced if they are subjected to large temperature changes.

Info: The temperature to voltage compensation slope the BTS uses is 5mV/°C/Cell from 0-50°C.



Battery Temperature to Charge Voltage Change

3.4 Transfer Time

While in **States #11 and #12**, the AC input is continually monitored. Whenever AC power falls below the VAC dropout voltage (100 VAC per leg, default setting), Energizr automatically transfers to **States #5 or #7**.

This transfer occurs in approximately 16 milliseconds. While the Energizr is not designed as a computer UPS system, this transfer time is usually fast enough to hold transfer without resetting. The lower this setting, the longer the effective transfer will be and therefore, the higher the probability for the output loads to reset.

This occurs because the incoming AC voltage is allowed to fall to a level that is so low, that when the transfer does occur (in addition to the relay transfer time) the voltage on Energizr's output has already fallen to a low enough level to reset the loads.

The disadvantage of a higher VAC dropout setting is that smaller generators (or large generators with an unstable output) may nuisance transfer. This commonly happens when powering loads that are larger than the generator can handle - causing the generator's output to constantly fall below Energizr's input VAC dropout threshold.

3.5 Transfer Back

While operating in off-grid mode (**States #1 through #8)** Energizr monitors the state of the AC Grid port and attempts to qualify the voltage and frequency of the Grid. If the AC Grid port is qualified and it stays qualified for 60 seconds, then the AC input port is re-enabled and the system switches over to States #9 through#12.

3.6 Protection Circuitry Operation

Energizr is protected against fault conditions. If a condition occurs that is outside Energizr's normal operating parameters, then it will shut down and attempt to protect itself, the battery bank, and AC loads. When any of the following fault conditions occur, the Fault LED is turned on.

The following are some of the conditions that would cause Energizr to shut down:

Low Battery - Energizr will shut off whenever the battery voltage falls to the **LBCO** (Low Battery Cut Out) level to protect the batteries from being over-discharged. After Energizr has reached the LBCO level and turned off, Energizr will automatically restart after one of the following conditions:

1. AC Power is applied and Energizr begins operating as a battery charger.
2. Battery voltage rises to the **LBCI** (Low Battery Cut In) level.

High Battery - In the event the battery voltage approaches the **HBCO** (High Battery Cut Out) level, Energizr will automatically shut down to prevent Energizr from supplying unregulated AC output voltage. Energizr's System LED turns off when a high battery fault condition occurs.

Energizr will automatically restart when the battery falls to the **HBCI** (High Battery Cut In) level.

Info: High battery voltage may be caused by excessive or unregulated voltage from solar panels or other external charging sources.

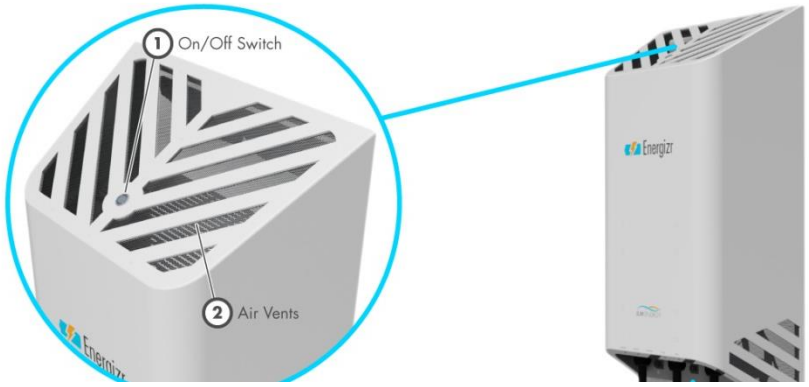
Overload - During inverter and standby operation, Energizr monitors the DC and AC current levels. In the event of a short circuit or overload condition, Energizr will shut down. The inverter will need to be reset to start operating.

Over-temperature - If internal power components begin to exceed their safe operating temperature level, Energizr will shut down to protect itself from damage. Energizr's System LED turns OFF to indicate the over-temperature fault condition. Energizr will automatically restart after the units cools down.

Internal Fault - Energizr continually monitors several internal components and the processor communications. If a condition occurs that does not allow proper internal operation, the inverter will shut down to protect it and the connected loads.
Energizr will need to be reset to start operating

3.7 Start-Up

ON/OFF Button - Energizr can be turned on and off by lightly pressing, holding and releasing the Power button located at the top (early units) or the right side (newer units) of the unit.



Power Switch and Status Indicator

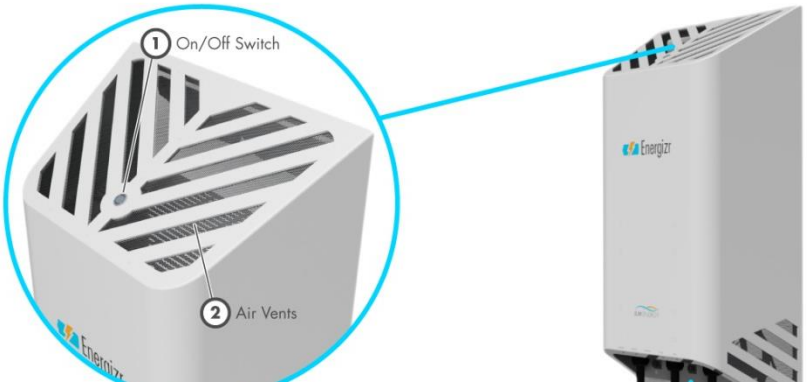
When Energizr is first connected to the batteries, or when its automatic protection circuit has turned Energizr off, the ON/OFF switch will need to be pressed to start the unit. Once Energizr has been turned on, pressing the Power ON/OFF switch alternately turns Energizr on and off.

WARNING: The Power ON/OFF control switch does not turn on or off the charger feature.

3.8 LED Operation

In addition to the LED indicators on the front panel, the On/Off push button on the front panel is equipped with a Blue indicator LED. The following is an explanation of the operation of these indicator LEDs.

LED Indicators



Status LED Indicator

Status LED:

Off: Dark. System is turned OFF.
On: Solid Blue: Battery is connected to Energizr and the system has been turned on by pressing the system On/Off push button.

Fault LED:

Off: Dark. No System faults detected.
On: Solid Red: System Fault detected.

System LED:

Off: Dark. Neither the AC Grid nor an external generator is available or qualified.
On: Solid Green: AC Grid is available and qualified.
Blinking: Flashes green once every two seconds. This indicates that an external generator is available, qualified, and powering the AC input of the system.

Renewable Energy (RE) LED:

Off: Dark. RE relay is open, usually due to grid not being available and high battery state of charge.
On: Solid Blue: RE relay is closed and Energizr is ready for renewable energy source to connect.

Inverting LED:

Off: Dark. AC output relay is open and the system output is not loaded.
On: Solid Yellow: AC output relay is closed.

Charging LED:

Off: Dark. Batteries are being discharged.
On: Solid Red: Batteries are fully charged.
Blinking: Flashes red:
Once every 2 seconds: Bulk Charging
Once every 1 second: Absorb Charging
Once every ½ second: Float Charging

3.9 Factory Default Values

Energizr uses default values for the adjustable settings shown in the table below. These settings are adequate for most installations. If some of your operating parameters need to be changed from the default values, these parameters can be programmed at the factory or by an authorized dealer in the field.

Shore Max - This setting ensures Energizr AC loads receive the maximum current available from the utility or generator power. When the total current used to power the AC loads and charge the batteries begins to approach the *Shore Max* setting, the current that was used for charging the batteries will automatically be reduced.

01 Search Watts: This setting allows you to turn off the power-saving Search Mode circuitry or adjust the power level at which Energizr will "wake up" and start inverting.

02 LowBattCutOut: This setting determines when Energizr will turn off based on low battery voltage. Energizr turns off automatically after the battery voltage has been below this setting for more than one minute. This protects the batteries from over-discharge and the AC loads from unregulated power (brown-outs).

03 Batt AmpHrs: This setting allows the user to input the battery bank size in amp hours which tells the charger how long to charge the batteries in the Absorb charge stage.

04 Battery Type: Sets the type of batteries being used in the system; this information tells the charger what voltage level to use to charge the batteries.

05 Charge Rate: This setting can be used to turn off the charger, limit the amount of current that the charger can use (leaving more current available to power loads); or to ensure small battery banks are not overheated because of a charge rate that is too high.

06 VAC Dropout: Sets the minimum AC voltage that must be present on the AC input before the unit transfers from Standby Mode to Inverter Mode. This protects the AC loads from utility outages and brown-outs. On Energizr models, when two inputs (leg 1 and leg 2) are used, the VAC Dropout voltage is determined by the sum of the two inputs ÷ 2. For example, if input 1 = 120VAC and input 2 = 110 VAC, the sum (230) ÷ 2 = 115. In this example, 115 VAC is what Energizr's AC input is sensing to determine when to stay connected or disconnect and start inverting.

Adjustable Settings	Default Values
Shore Max	60A
01 Search Watts	5W
02 Low Battery Cut Out	20V (24V setup) and 40V (48V setup)
03 Battery Ah	600 Ah
04 Battery Type	Flooded Lead Acid (24V model+ Bulk: 29.2V, Float: 26.8v) and 48V setup (Bulk: 58.4V, Float: 53.6V)
05 Charge Rate	100%
06 VAC Dropout	100 VAC

3.10 Parallel Operation

This section provides information about operating Energizr in parallel.

WARNING: The information in this section is meant to supplement the information in previous sections. To prevent personal injury or equipment damage, you must carefully read and follow all instructions and warnings in this manual.

Overview

A single Energizr produces 120/240VAC at its rated power of 4400 watts (18 amps) when it is not connected to grid power. A single Energizr can support 7200 watts (30 amps) when it is connected to grid power.

Parallel stacking synchronizes multiple inverters to work together as a single inverter/charger system to increase Energizr's continuous and surge capacity, increase the charging capability to the battery bank and increase the AC pass-through capacity.

The Energizr Controller, Option-010 is required to operate multiple Energizrs in phase by having one of the inverters operate as the Master and the others as Slaves.

When first turned on, all the stacked inverters are powered and begin to monitor the power required by the AC load. If the power required by the AC load decreases, the slave inverters power down into Power Standby mode until needed. The Power Standby feature allows Energizr to shut down to reduce power consumption and quickly begins inverting when the loads demand more power.

Because the paralleled inverters operate as a single unit, the total battery charging capability and AC pass-through capacity are also increased. This helps with the fuel consumption efficiency and available current to transfer to loads when using large generators. When the generator (or utility power) is connected to the parallel system, the Master inverter first synchronizes and then connects.

Since the Slave inverter(s) follow the Master inverter, they are prevented from connecting until the Master inverter has synchronized and connected. After the full system has connected, battery charging begins. This allows a smooth transition from inverter mode to charger mode since the slave inverters are already synchronized when they transfer the loads and start battery charging.

Conditions for Parallel System

When connecting units in parallel, the following requirements must be met:

1. Only Energizrs are capable of being stacked in parallel and models must be identical for parallel stacking.
2. A maximum of four identical Energizrs can be connected in parallel.
3. Energizr Controller, Option-010 router must be connected to communicate and synchronize with other Energizrs for parallel operation.
4. The Router Sync Cable must be used to connect directly from the Energizr Controller (Option-010) to each inverter.
5. Energizrs must be connected to the same battery bank.
6. The DC connection cables from the battery to Energizr must be of equal length and size.
7. Energizrs' negative terminals must be connected together either at the unit or at a location close to Energizrs (within 18 inches / 0.5 meters).
8. The AC input cables to each inverter as well as the AC output cables from each inverter must be of equal length and size (length to AC input may be different from length to AC output).
9. Place Energizrs close to each other, but allow at least 3" for ventilation purposes under, above and in front of Energizr.

10. The AC input to every Energizr must be from the same AC source and the two 120VAC legs from that AC source into each inverter input must be 180° out-of-phase from each other.
11. Each Energizr must have appropriate AC and DC overcurrent protection.

Parallel System Connections and Components

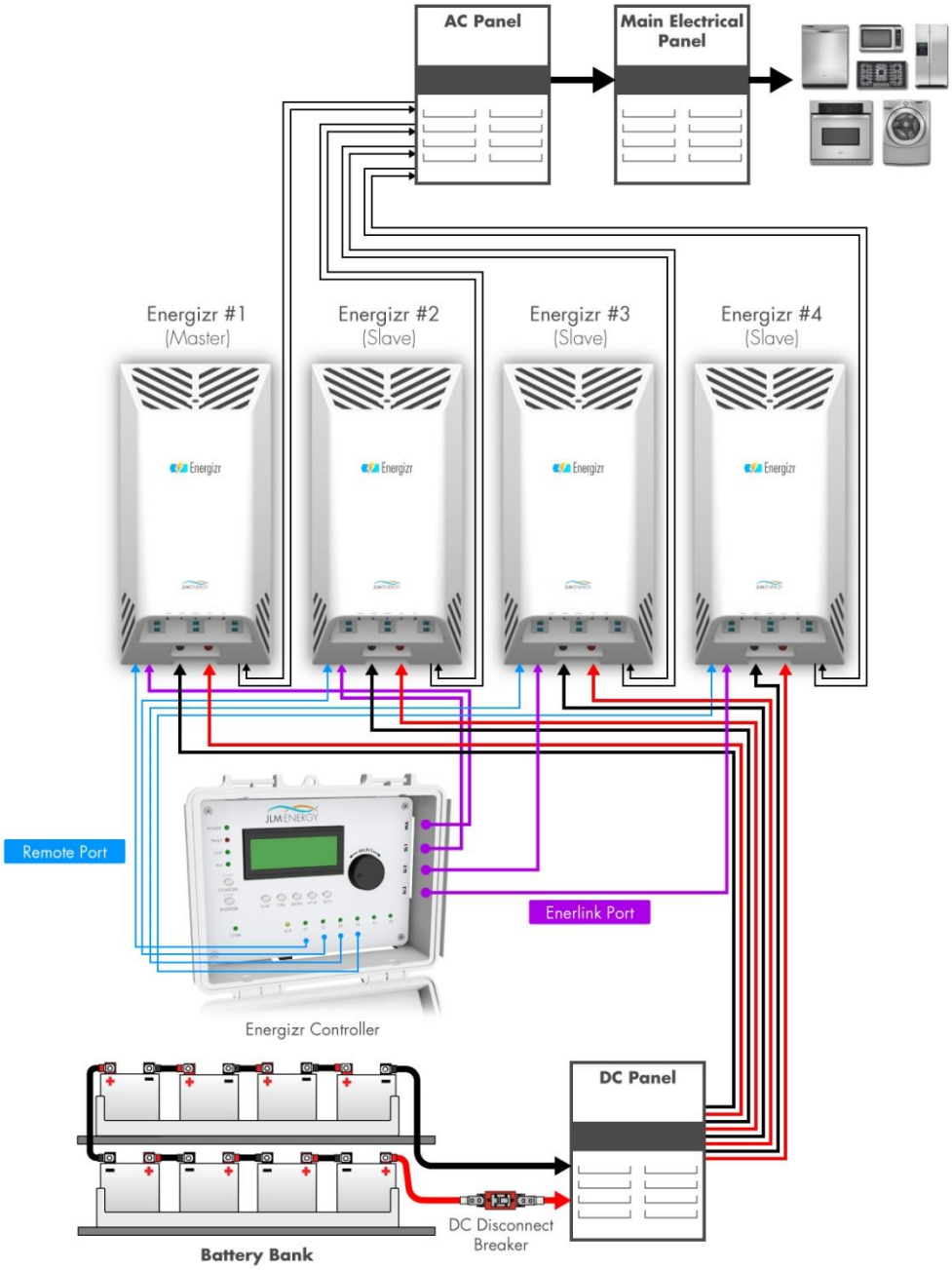
The basic installation procedure of the parallel system is similar to that of a single Energizr system. However, the AC and DC connections and components required in the parallel system must be considered.

AC Connections Required in Parallel System

The AC input supply to the parallel system must be a 120/240 VAC split-phase system that provides two line conductors (referred to as L1 and L2), a neutral, and ground. Each Energizr must be protected with a double-pole circuit breaker rated for a maximum of 30A each pole.

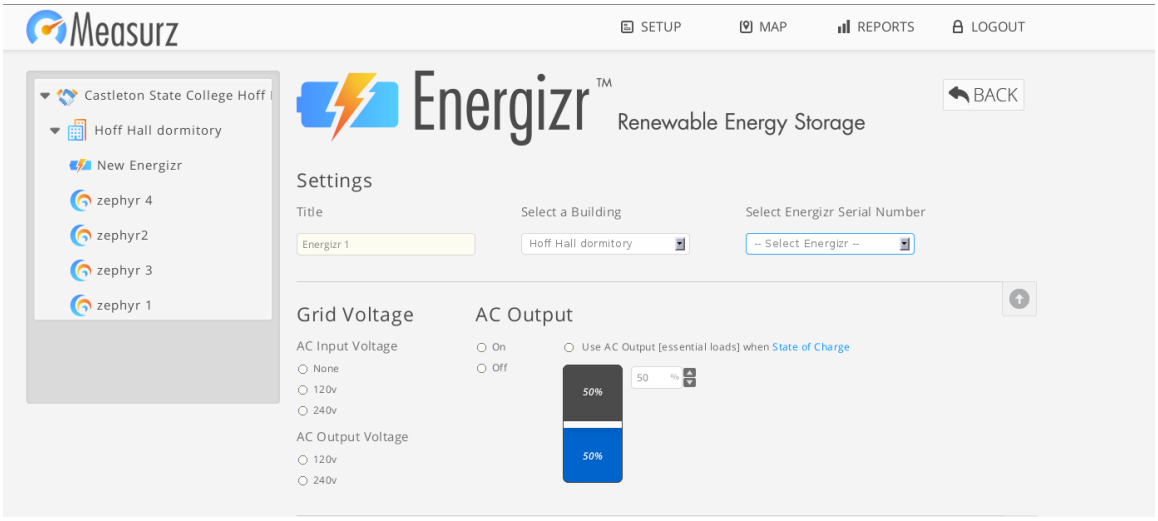
DC Connections Required in Parallel System

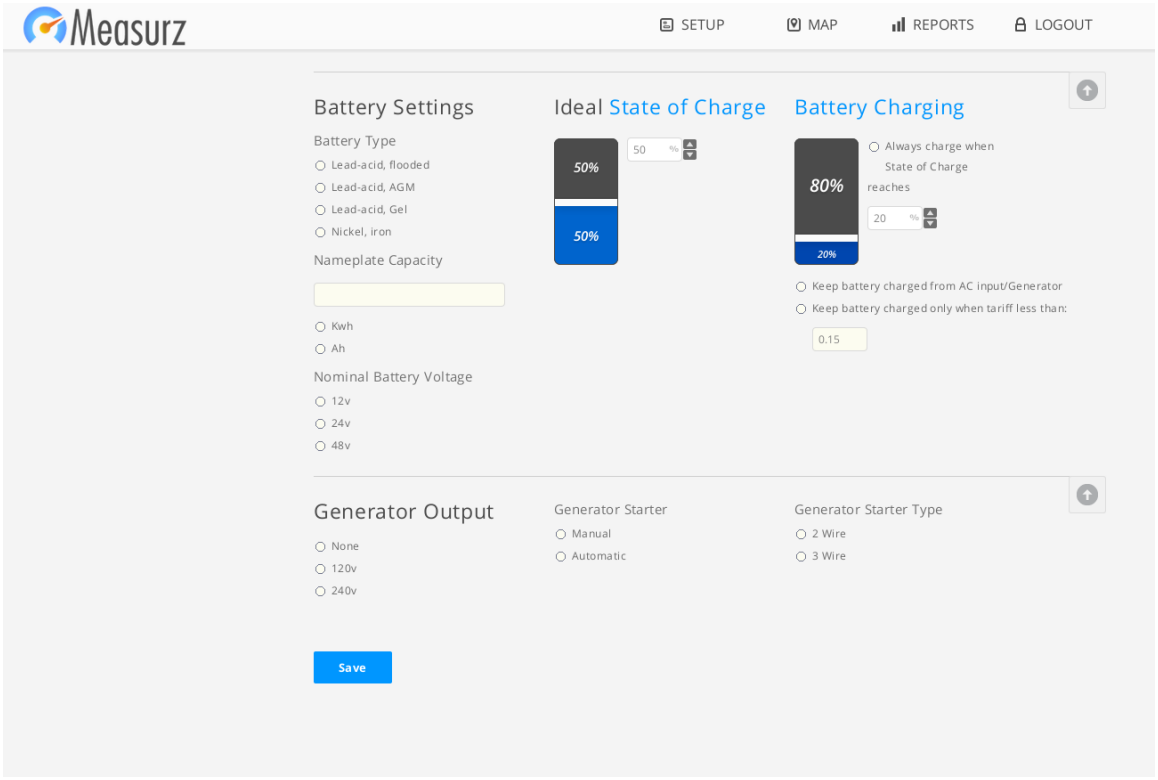
When Energizrs are stacked they must operate from a common battery bank. In other words, the DC negative and positive of all Energizrs must be common.

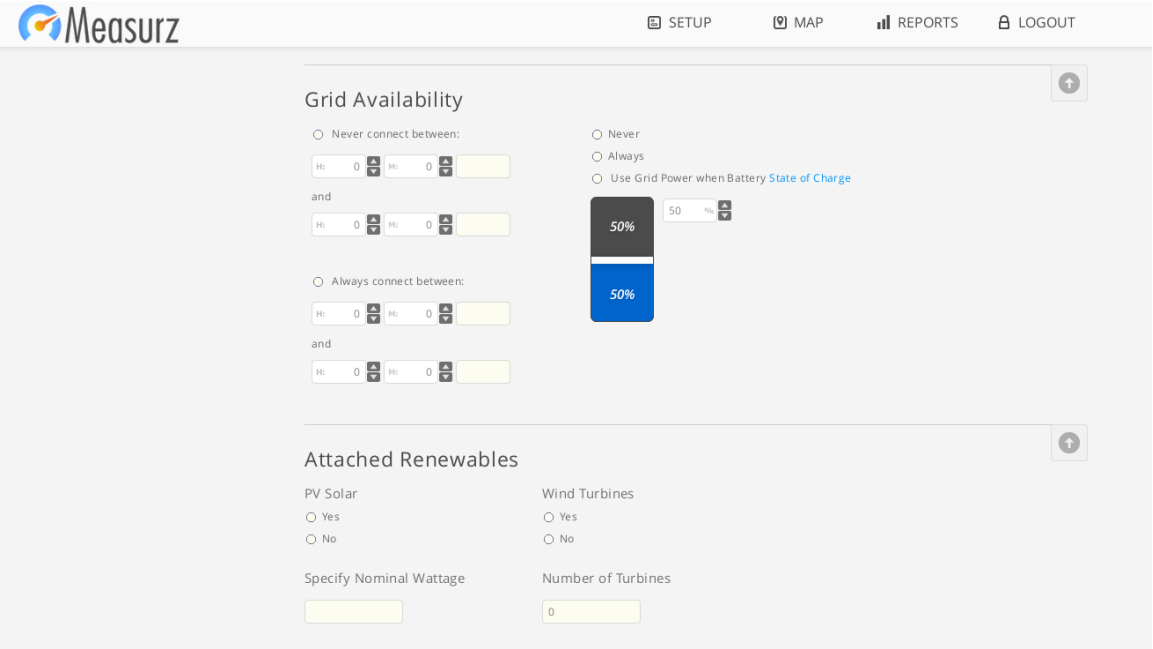


Parallel Operation Wiring

3.11 Measurz Interface: Cloud-based Software



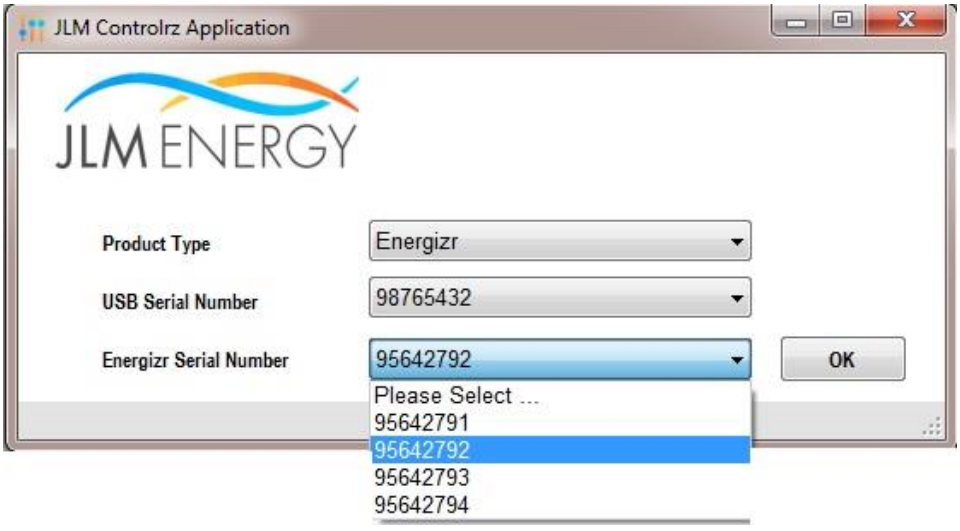




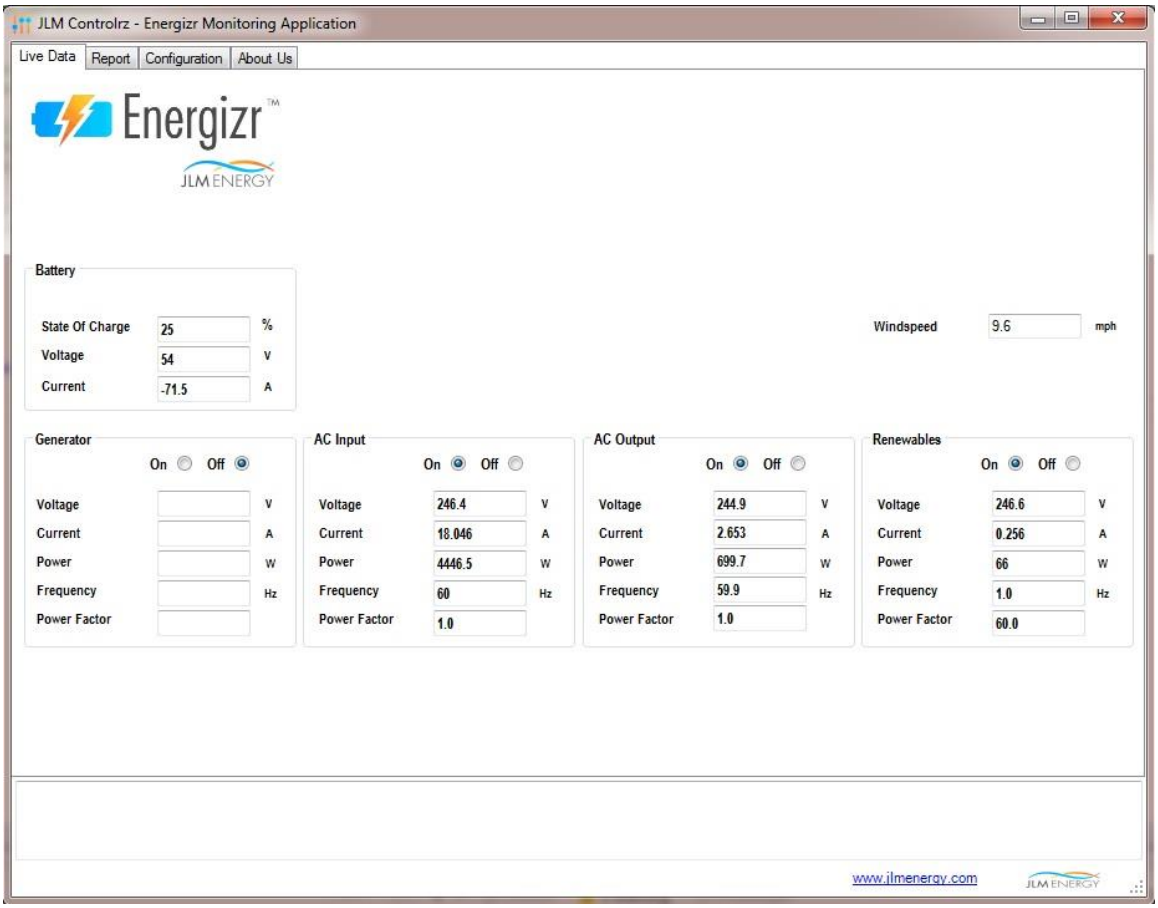
3.12 Controlrz Interface

Controlrz is a Windows application that communicates with JLM products through an Ethernet connection between a computer and Energizr.

After installing the application on a PC (windows 7 or higher), the user can select the specific product (in this case Energizr). Subsequently, the serial number of the specific Energizr unit may be selected.



Once the user clicks on the “OK” button, the following screen shows the basic system parameters in real time.


JLM Controlrz - Energizr Monitoring Application
Live Data
Report
Configuration
About Us
Energizr™
JLM ENERGY
Battery
State Of Charge 25 %
Voltage 54 V
Current -71.5 A
Windspeed 9.6 mph
Generator
On Off
Voltage V
Current A
Power W
Frequency Hz
Power Factor
AC Input
On Off
Voltage 246.4 V
Current 18.046 A
Power 4446.5 W
Frequency 60 Hz
Power Factor 1.0
AC Output
On Off
Voltage 244.9 V
Current 2.653 A
Power 699.7 W
Frequency 59.9 Hz
Power Factor 1.0
Renewables
On Off
Voltage 246.6 V
Current 0.256 A
Power 66 W
Frequency 1.0 Hz
Power Factor 60.0
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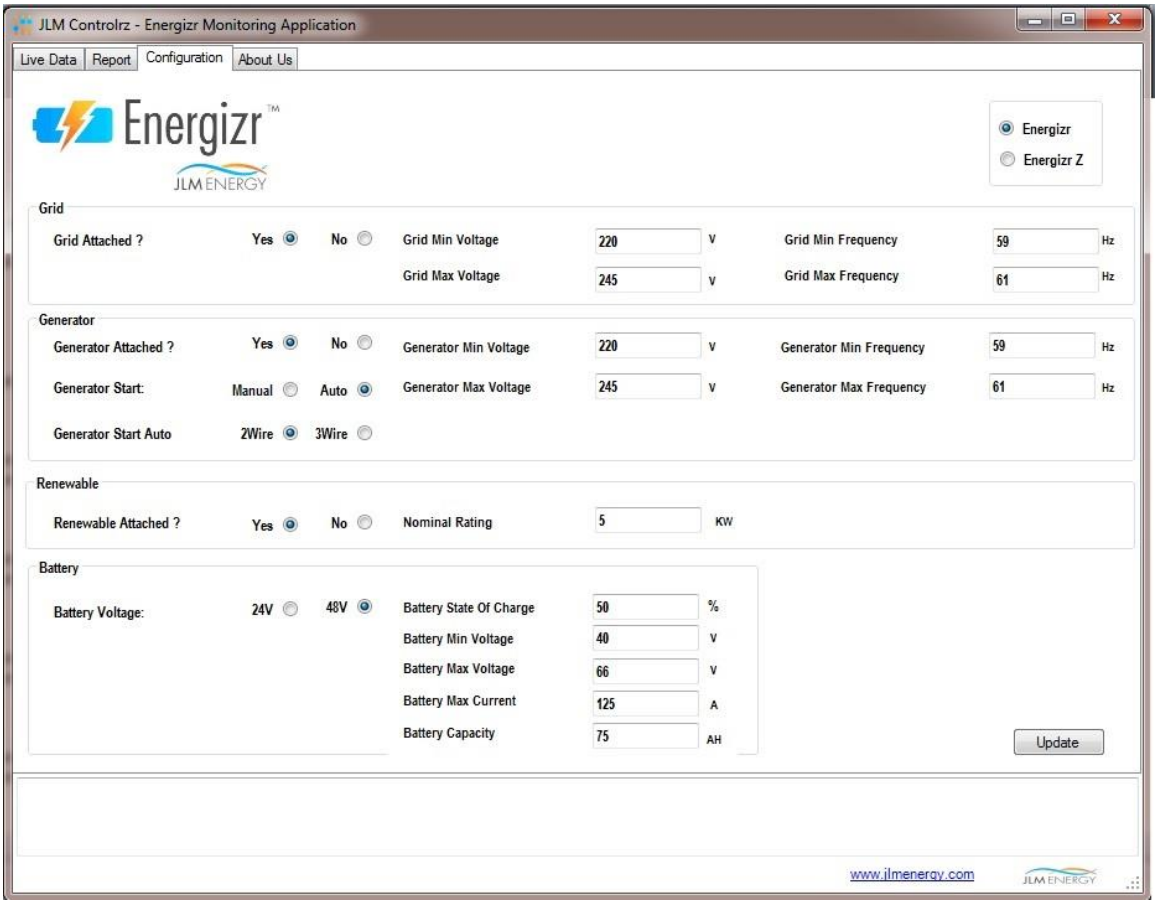
JLM ENERGY

The Configuration tab displays the current setting on the system. These settings are user-configurable:



The Report tab, displays the data related to the selected Energizr in a real time chart format:

4.0 General Information

4.1 Product Warranty:

Energizr Micro-Grid System
5-Year Limited Warranty

JLM Energy Inc. (“JLM”) has developed a highly reliable micro-grid platform, designated as the Energizr, which is designed to withstand normal operating conditions when used for its originally intended purpose in compliance with the JLM User Manual made available with the originally shipped system.

The JLM limited warranty (“Limited Warranty”) covers defects in workmanship and materials of Energizr (“Defective Product”) for a period of five (5) years (the “Warranty Period”) from the date of original purchase at point of sale to the originally-installed end user location in locations where we have approved Energizr for installation.

During the Warranty Period, the warranty is transferable to a different owner as long as Energizr remains installed at the originally-installed end user location. During the Warranty Period, if JLM establishes, through inspection, the existence of a defect that is covered by the Limited Warranty, JLM will at its option, either (1) repair or replace the Defective Product free of charge, or (2) provide a credit or refund to the owner of the system at the originally-installed end user location in an amount not to exceed (a) the then-current price of a “like kind” Energizr that is available for purchase by the system owner at the time of the Limited Warranty claim, or (b) the original cost of the Energizr that is subject to a Limited Warranty claim.

If JLM elects to repair or replace the Defective Product, JLM will, at its option, use new and/or re-conditioned parts in repairing or replacing the Defective Product. JLM reserves the right to use parts or products of original or improved design in the repair or replacement of Defective Product.

If JLM repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days from the date of JLM's return shipment of the repaired or replacement product, whichever is later.

The Limited Warranty covers a replacement unit to replace the Defective Product, but does not include labor costs related to (1) un-installing the Defective Product or (2) if applicable, re-installing a repaired or replacement product. To the extent applicable, the Limited Warranty also covers the costs of shipping a repaired or replacement product from JLM, via a non-expedited freight carrier selected by JLM. The Limited Warranty does not cover, and JLM will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

JLM Energizrs are designed to withstand normal operating conditions and typical wear and tear when used for their original intent and in compliance with the installation and operating instructions supplied with the original equipment. The Limited Warranty does not apply to, and JLM will not be responsible for, any defect in or damage to any Energizr: (1) that has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally; (2) that has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the JLM User Manual or applicable laws or regulations; (3) that has been subjected to fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Energizr's specifications, including high input voltage from generators or lightning strikes; (4) that has been subjected to incidental or consequential damage caused by defects of other components of the system; or (5) if the original identification markings (including trademark or serial number) of Energizr have been defaced, altered, or removed.

The Limited Warranty does not cover costs related to the removal, installation or troubleshooting of the customer's electrical systems. The Limited Warranty does not extend beyond the original cost of the Energizr.

To obtain repair or replacement service, credit or refund (as applicable) under this Limited Warranty, the customer must comply with the Return Merchandise Authorization Number (RMA) policy and procedure by sending an email to PROJECTS@JLMEI.com and asking for an RMA number.

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY JLM AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN

NO EVENT WILL JLM BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the Energizr; such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some regions do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from region to region.

Exclusions
If this product is a consumer product, federal law does not allow an exclusion of implied warranties. To the extent you are entitled to implied warranties under federal law, to the extent permitted by applicable law they are limited to the duration of this Limited Warranty. This Limited Warranty gives you specific legal rights. You may have other rights which may vary from state to state or province to province.

Warning: Limitations on Use
Please refer to your product manual for limitations on uses of the product.
SPECIFICALLY, PLEASE NOTE THAT THE ENERGIZR SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, PPS MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING THE USE OF ENERGIZR IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

4.1 Product Warranty:

Energizr Micro-Grid System
10-Year Limited Warranty

JLM Energy Inc. (“JLM”) has developed a highly reliable micro-grid platform, designated as the Energizr, which is designed to withstand normal operating conditions when used for its originally intended purpose in compliance with the JLM User Manual made available with the originally shipped system.

In consideration for the purchase of the Extended Warranty by the customer, the JLM Extended Warranty (“Extended Warranty”) covers defects in workmanship and materials of Energizr (“Defective Product”) for a period of ten (10) years (the “Warranty Period”) from the date of original purchase at point of sale to the originally-installed end user location in locations where we have approved Energizr for installation.

During the Warranty Period, the warranty is transferable to a different owner as long as Energizr remains installed at the originally-installed end user location. During the Warranty Period, if JLM establishes, through inspection, the existence of a defect that is covered by the Limited Warranty, JLM will at its option, either (1) repair or replace the Defective Product free of charge, or (2) provide a credit or refund to the owner of the system at the originally-installed end user location in an amount not to exceed (a) the then-current price of a “like kind” Energizr that is available for purchase by the system owner at the time of the Limited Warranty claim, or (b) the original cost of the Energizr that is subject to a Extended Warranty claim.

If JLM elects to repair or replace the Defective Product, JLM will, at its option, use new and/or re-conditioned parts in repairing or replacing the Defective Product. JLM reserves the right to use parts or products of original or improved design in the repair or replacement of Defective Product.

If JLM repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days

from the date of JLM's return shipment of the repaired or replacement product, whichever is later.

The Extended Warranty covers a replacement unit to replace the Defective Product, but does not include labor costs related to (1) un-installing the Defective Product or (2) if applicable, re-installing a repaired or replacement product. To the extent applicable, the Limited Warranty also covers the costs of shipping a repaired or replacement product from JLM, via a non-expedited freight carrier selected by JLM. The Limited Warranty does not cover, and JLM will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

JLM Energizrs are designed to withstand normal operating conditions and typical wear and tear when used for their original intent and in compliance with the installation and operating instructions supplied with the original equipment. The Limited Warranty does not apply to, and JLM will not be responsible for, any defect in or damage to any Energizr: (1) that has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally; (2) that has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the JLM User Manual or applicable laws or regulations; (3) that has been subjected to fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Energizr's specifications, including high input voltage from generators or lightning strikes; (4) that has been subjected to incidental or consequential damage caused by defects of other components of the system; or (5) if the original identification markings (including trademark or serial number) of Energizr have been defaced, altered, or removed.

The Extended Warranty does not cover costs related to the removal, installation or troubleshooting of the customer's electrical systems. The Extended Warranty does not extend beyond the original cost of the Energizr.

To obtain repair or replacement service, credit or refund (as applicable) under this Limited Warranty, the customer must comply with the Return Merchandise Authorization Number (RMA) policy and procedure by sending an email to PROJECTS@JLMEI.com and asking for an RMA number.

THE EXTENDED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY JLM AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN NO EVENT WILL JLM BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN

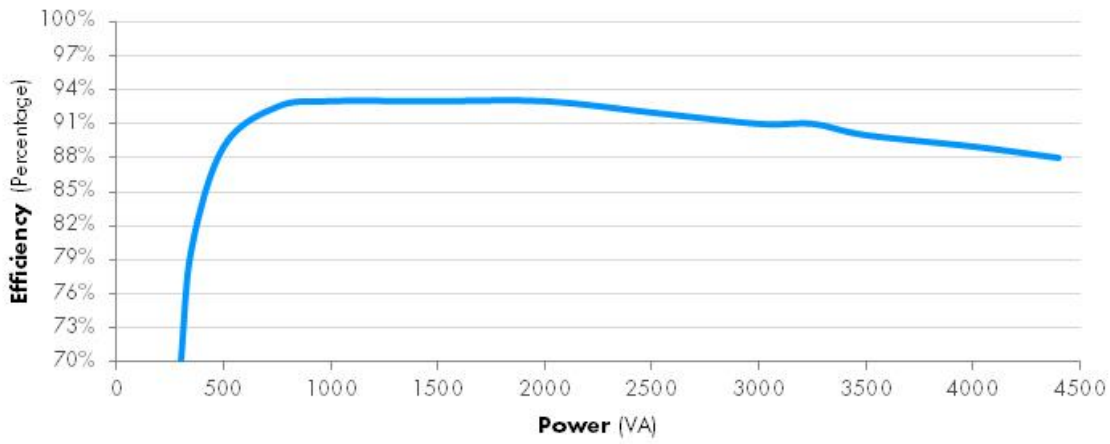
CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the Energizr; such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some regions do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from region to region.

Exclusions
If this product is a consumer product, federal law does not allow an exclusion of implied warranties. To the extent you are entitled to implied warranties under federal law, to the extent permitted by applicable law they are limited to the duration of this Limited Warranty. This Limited Warranty gives you specific legal rights. You may have other rights which may vary from state to state or province to province.

Warning: Limitations on Use
Please refer to your product manual for limitations on uses of the product.
SPECIFICALLY, PLEASE NOTE THAT THE ENERGIZR SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, PPS MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING THE USE OF ENERGIZR IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

4.2 CEC Efficiency Curves and Ratings



4.3 Compliance

Energizr conforms to ANSI / UL STD 1741, 2nd Edition and Certified to CSA STD C22.2 No. 107.1-01.

Intertek
4009665

4.4 Energizr Options

Option-001: External Generator Interface
Option-002: No longer available
Option-003: AC circuit breakers for AC Input (Grid), AC Output (Load), Renewable Input, and Generator Input mounted in the Energizr Junction Box
Option-004: Wi-Fi (instead of Ethernet)
Option-005: No longer available
Option-006: No longer available
Option-007: Wireless Radio Connectivity
Option-008: RS-485 Connectivity
Option-009: Energizr Controller
Option-010: Energizr Parallel Controller
Option-011: Battery Rack

Option-009: Energizr Controller

Option-010: Energizr Parallel Controller

Option-011: Battery Rack

4.5 Revision History

Date	Author	Version	Changes
10.12.13	FD	0.1	
10.20.13	FD	0.2	
4.14.14	GS	1.0	Removed UL Pending Notes
4.29.15	SM	2.0	Revised Installation & Commissioning Procedures. Revision of Energizr Options.

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